SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

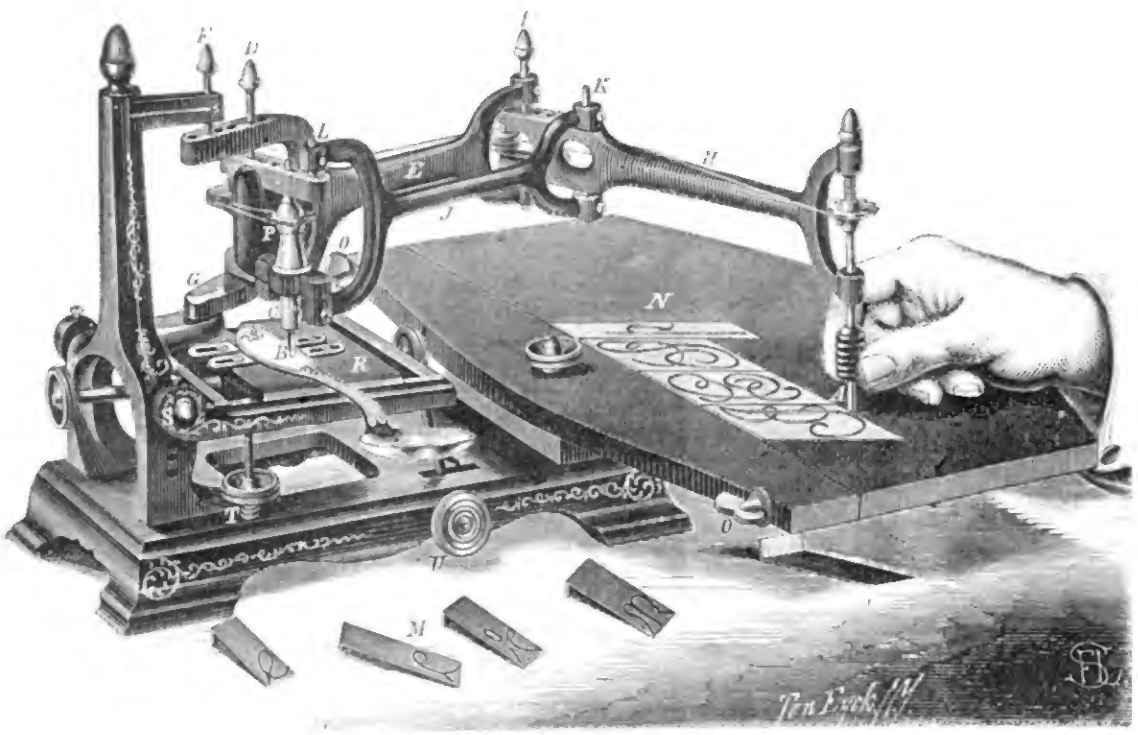
Vol. XXIII.---No. 5. [NEW SERIES.] NEW YORK, JULY 30, 1870. $3 per Annum. [IN ADVANCE.]

Improved Engraving Machine.

We illustrate herewith a beautiful device, whereby letters or figures traced upon patterns may be exactly copied upon metal by engraving, with, it is claimed, greater facility and accuracy than by a skilled hand engraver.

In order that our readers may fully understand the operation of this machine it will be necessary first to explain how the movements of the tracing point, A, are repeated by the engraving tool at B.

The engraving tool is fastened in a spindle or chuck, C, which chuck is held by vertical bearings in a swinging frame. This frame swings on a pivot, D, above, and a corresponding pivot below, in the crotch of the swinging arm, E, which is pivoted at F and G. It will now be evident that all motions of the arm, H, not radial to the pivot, I, which joins the arms, H and E, will move the arm, E, which will carry the swinging frame, with it. But the swinging frame, is connected to the arm, H, also by an arm, J, pivoted at K and L, so that all radial motion of the tracing point, A, about the pivot, I, is also transmitted through the arm, H, and the arm, J, to the swinging frame. Thus all the motions of the tracing point, A, are repeated by the graver, B, but diminished in extent according as the pivots, I and K, and F and D, with their corresponding pivots below, are placed near to, or more remote from each other.



SPENCER'S ENGRAVING MACHINE.

These pivots work in counter-sunk holes, properly spaced so that five or more different sizes of letters can be cut from the same patterns.

The patterns are shown at M. It will be seen that they are metallic plates with the letters cut upon them, and having a portion bent down at an acute angle. These patterns are gripped by a joint in the table, N, which joint is drawn together by thumb-screws, O. The patterns or types, M, are cut by machinery, and are as perfect as they can be made.

In order that the graver, B, shall cut properly, it is necessary that it shall always maintain a certain relative position to the direction in which it moves. This is very ingeniously provided for. The spindle which carries the tracing point may be rotated between the thumb and finger of the operator, and this rotary motion is transmitted to the graver spindle through a cord belt connecting the pulleys, P and Q. Thus the operator always keeping a particular side of the tracer spindle in the direction it moves regulates the position of the graver.

The pulleys, P and Q, are formed of disks of sheet metal, which are cut radially about the perimeters and alternate divisions bent in opposite directions, so as to form grooves broken at their edges. This prevents the slipping of the cord belt, and insures a positive motion.

The article to be engraved is placed and clamped upon a spring bed, R, pivoted at S. The spring shown at T regulates the pressure against the graver, its tension being altered as desired by a thumb-screw.

During the process of engraving the pressure against the graver is also varied so as to perform shading, by means of a milled thumb-nut, U, which, through the agency of a link, raises or depresses the pivoted spring-bed, R.

The inventor informs us this machine has been thoroughly tested, practically, and that its operation has given perfect satisfaction.

Patented, February 15, 1870, by J. C. Spencer. Address, for further information, Spencer, Banta & Harris, Phelps, N. Y.

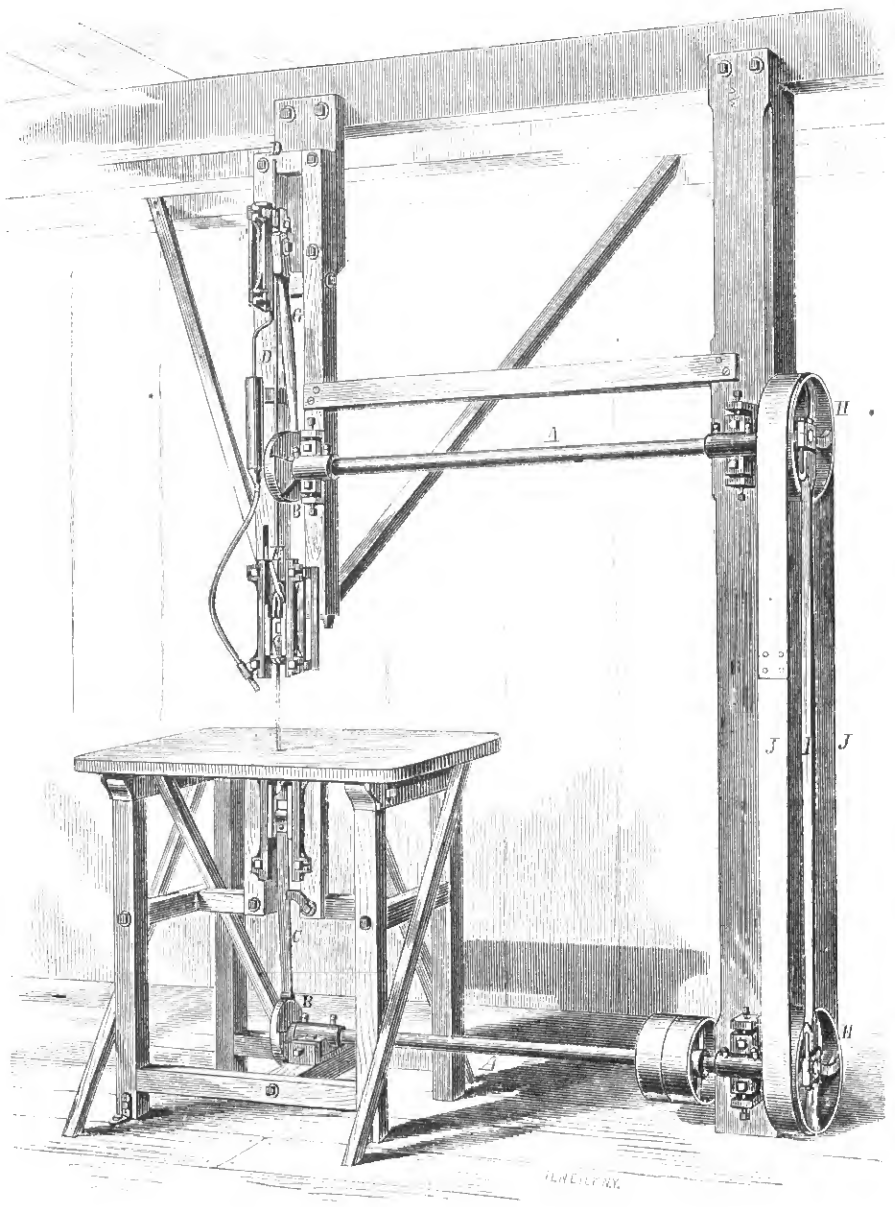
Positive Action Scroll Saw.

Our engraving shows a novel form of that most useful machine, the scroll saw, whereby the following advantages appear to us, upon personal examination of the machine in operation, to be secured.

It is extremely simple in construction, as will appear from the description below. The parts are so proportioned as to secure durability, the shafts being of ample size, and running in self-adjusting metal boxes. Its motion is remarkably steady, the saw apparently running as well at a speed of 700 as at half that speed. It can be set at any length of saw, from eight to thirty inches, and will run any width down to less than one eighth. The taking out or putting in of the saw, can be done in a moment of time, and the proper tension secured.

The saw has a direct action from the two crank shafts, A, without the use of a spring or any similar device liable to get out of order, thereby giving the saw a positive motion, the saw being *drawn each way*, so that in the event of the pin breaking at either end its motion at once ceases, and it can neither break nor bend, nor damage the most delicate work.

The crank shafts, A, impart motion to the crank wheels, B. The saw is stretched between the cranks as follows. The lower crank pin carries a collar from which a leather strap, C, extends to the end of the lower crosshead. From the upper end of the saw extends a light iron rod, D, connected to the crosshead at the top of the saw by a toggle joint and lever, E, by which the saw is put under tension. The rod, D, passes up and through a fixed nut in the crosshead, F, so that by simply turning the rod the tension may be adjusted as desired. The crosshead, F, receives motion from a pitman, G, connecting it to the upper crank pin. The two shafts, A, are further connected by means of the pulleys, H, and the connecting rod, I, the belt J, being employed simply to carry the upper shaft over the dead center.



BEACH'S POSITIVE ACTION SCROLL SAW.

The crosshead at the top of the saw is made adjustable vertically by a simple device at the back not shown in the engraving, whereby its position may be very quickly regulated for any required length of saw, and the "rake" of the saw may be also fixed as desired

The crossheads are made of metal with wooden gibs, which may be replaced quickly and cheaply anywhere, without resorting to a machine shop.

All the wheels and revolving parts are accurately balanced so that the objectional jar often met with in other forms of scroll sawing machines is entirely removed. The usual appliance for blowing away the sawdust, completes the working parts of this simple machine.

A considerable number of these saws are now running in large wood-working establishments in this city, and the parties using them testify in high terms to their superiority in the respects above enumerated.

An experiment is also in progress, having for its object the application of this principle of mounting saws, to such as are used in sawing lumber from the log.

For further information, address the manufacturer, Henry L. Beach, at Montrose, Pa., or at his office, 42 John Street, New York city, where a machine may be seen in operation.

Coal Mines on Fire.

There are many instances of vast masses of coal which have ignited and have been burning for years. When once well ignited, and all communication with the external air is not entirely cut off (and some imperceptible fissures are quite sufficient to prevent this), then the devouring element pursues its course without interruption. It partially burns the coal and calcines the sandstone and adjacent schists, changing their colors to a sort of red, and altering their composition. At Brule, near Saint Etienne, there is a coal mine which has been on fire from time immemorial. The soil at the surface is baked and barren; hot vapors escape from it; sulphur, alum, sal ammoniac, and various natural products are deposited on it; it might be supposed to be a portion of the accursed cities formerly consumed by the fires of heaven and earth.

Other burning coal mines are cited in France; for example, those of Decazeville, in Aveyron, and of Commentry, in the department of Al

lier. The inhabitants have even for a long time kept up these fires for the sake of working the aluminous salts which are given off from the coal and are deposited on the surface of the soil as a whitish efflorescence.

In the carboniferous basins of the Saarbruck and Silesia, there are likewise coal mines which have been on fire for a long time. In Belgium, between Namur and Charleroi, at a place called Falizolle, the fire has been alight for many years. The inhabitants formerly were in the habit of working the coal on their own account. Now it frequently happened that two parties came in contact, causing endless disputes and sometimes sanguinary fights. A favorite way of keeping rivals or competitors at a distance, was to throw pieces of old leather on a burning brazier, causing an insupportable stench. One day the fire extended also to the coal, since which time it has never ceased burning. The fire, which burns underground, is seen through fissures in the surface. Sulphur deposits itself round these vents, and acid gases are evolved.

In England, especially in Staffordshire, the ignition of the coal has produced surprising effects of alteration in the measures containing coal. The sandstones have become vitrified, baked, and dilated by the fire, the banks of plastic clay hardened and charged into porcelain.

In the environs of Dudley there was formerly a coal mine on fire. The snow melted in the gardens as soon as it touched the ground. They gathered three crops a year; even tropical plants were cultivated; and, as in the Isle of Calypso, an eternal spring prevailed. In another Staffordshire colliery, the firing of which dates many years back, and which is called by the inhabitants, "Burning Hill," it was noticed as at Dudley, that the snow melted on reaching the ground, and that the grass in the meadows was always green. The people of the country conceived the idea of establishing a school of horticulture on the spot. They imported colonial plants at a heavy expense, and cultivated them in this kind of open-air conservatory. One fine day the fire went out, the soil gradually resumed its usual temperature, the tropical plants died, and the school of horticulture was under the necessity of transferring the gardens elsewhere.

Near Mauch Chunk, Pa., is a burning coal mine, which has been on fire for many years.

RICHARD TREVITHICK, INVENTOR OF THE LOCOMOTIVE.

[From All The Year Round,]

Trevithick finally made a steam carriage for common roads set it in motion, and away went the creature, tearing like mad along the road to Plymouth, breaking down walls, rushing into the gardens of sober-minded gentlemen intent only on their roses and their peaches, careering through toll-gates, flung open free of pay by terrified tollmen—who thought that this, too, was an invention and device of Satan; perhaps his ordinary chariot, with himself inside, sitting among the live embers. As Trevithick and one Vivian were steaming along the road, the latter caught sight of a closed toll-bar, just as they had torn down the front rails of a gentleman's garden.

"Captain" Vivian called to his partner to slacken speed, which he did, and came dead up to the gate, which was opened like lightning by the toll-keeper.

"What have us got to pay?" asked Captain Vivian, careful as to honesty if reckless as to grammar.

"Na—na—na—na!" stammered the poor man, trembling in every limb, with his teeth chattering as if he had got the ague.

"What have us got to pay, I ask?"

"Na—noth—nothing to pay! My de—dear Mr. Devil, do drive on as fast as ever you can! Nothing to pay!"

This story rests on the authority of Mr. Coleridge; and, "if not true, is too well found," as the Italians say, to be overlooked.

Trevithick's wonderful engine, after performing such exploits, and generally choosing to upset its passengers in a hedge, or over a stone wall, midway to their destination, was exhibited in London. Its owner and originator showing it off with wonderful effects, in Lord's Cricket-ground; carrying it along the new road, and Gray's Inn lane, down to that coach-builder's who had supplied the phaeton that ran with it. The next day it was exhibited in a cutler's shop, and the machinery worked for the pleasure of all comers; then it was run on a temporary tram-road laid down on the spot now called Euston square, and thrown open to the public as an ordinary sight of the time. But on the second day Trevithick, "in one of his usual freaks," closed the exhibition, and left hundreds waiting round the ground in a state of great wrath. The engine was about the size of an orchestra drum, and could be attached to a phaeton or other carriage.

TREVITHICK'S LOCOMOTIVE.

But a more useful triumph over difficulties was the railway locomotive, which Trevithick was the first to make, and which was used for the Merthyr Tydvil Railway, in 1804. This was an engine of an eight-inch cylinder, placed horizontally, as at present, with a four feet six-inch stroke, and which "drew after it upon the railroad as many carriages as carried ten tuns of bar iron, from a distance of nine miles, which it performed without any supply of water to that contained in the boiler at setting out, traveling at the rate of five miles an hour." This was considered a great triumph at the time; but Trevithick, like all the earlier locomotive projectors, was retarded and much troubled by the false idea that smooth wheels on a smooth rail would have no bite, and that, when dragging a heavy weight, they would just slip round, and do nothing else. Consequently, he put sundry rough projections on his wheels, much on the same plan as "roughing" a horse-shoe; and even we may well wonder at the five miles an hour, with ten tuns of bar iron, under all these disadvantages. Trevithick made another engine for the Wylam wagon-way, which at first could not be got to move at all, and, when it did, flew all to pieces, as its best exposition of the laws of motion. Near this Wylam wagon-way George Stephenson lived, whom all other men's railway failures and short-comings set to thinking and planning how he could make things work more easily together. And the result was an engine "which included the following important improvements on all previous attempts—namely: simple and direct communications between the cylinder and the wheels rolling upon the rails; joint adhesion of all the wheels attained by the use of connecting rods; and finally, a beautiful method of exciting the combustion of the fuel by employing the waste steam, which had formerly been allowed uselessly to escape into the air."

This was in 1815; but we have no business with such a date yet, and must go back to the time of Trevithick's traction-engine and Lord's Cricket-ground.

TREVITHICK'S INVENTIONS.

Shortly after the creation of that "chariot of the De'il," which ran shrieking along the road from Camborne to Plymouth, Trevithick and Vivian took out a patent for the application of high pressure to steam engines, and erected many high-pressure engines in Wales and elsewhere; which, however, were of less value than they might have been, owing to that fallacy of the rough wheels. For, though Trevithick was undoubtedly in advance of his age, and saw the coming of much that neither science nor society was then prepared to receive, though he was a man of vast genius and grand ideas; yet he could not look to everything, and it was reserved for another and more practical man to disencumber the wheels of locomotives, and take them out of leading-strings. But Trevithick was very fast, very universal, in his science. In the Catalogue of the South Kensington Museum he is described as "inventor and constructon of the first high-pressure steam-engine, and of the first steam-carriage used in England; constructor of a tunnel beneath the Thames, which he completed to within a hundred feet of the proposed terminus, and was then compelled to abandon the undertaking; inventor and constructor of steam-engines and machinery for the mines of Peru (capable of being transported in mountainous districts), by which he succeeded in restoring the Peruvian mines to prosperity; also of coining-machinery for the Peruvian Mint, and of furnaces for purifying silver ore by fusion; also inventor of other improvements in steam-engines, impelling-carriages, hydraulic engines, propelling and towing vessels, discharging and stowing ships' cargoes, floating docks, construction of vessels, iron buoys, steam boilers, corking, obtaining fresh water, heating apartments," etc. Surely a sufficiently wide range for one mind to travel over! It was he also who conceived the first idea of a screw-propeller; for nothing seemed to come amiss to him, and his science had a kind of prescient, prophetic character only found when there is genius as well as knowledge.

TREVITHICK'S ADVENTURES IN PERU.

Now we come to the most romantic and stirring period of Trevithick's career. In 1811 M. Uville, a Swiss gentleman, living in Lima, came to England to see what could be done for the silver mines in the Peruvian mountains, which had been abandoned from the impossibility of getting machinery out there which could clear them of water. The difficulty of transporting cumbrous machinery on the backs of feeble llamas over the Cordilleras, and the difficulty of working the engines even if they could be got there, seemed imperative. Watt and the rest gave no hope, and Uville was in despair. On the eve of departing from England with the conviction that the water in the Peruvian mines must stay there till the day of judgment, the Swiss gentleman chanced to see a small working model of Trevithick's engine in a shop window near Fitzroy square. This model he carried out with him, and saw it working successfully on the high mountain ridge of the Sierra de Pasco. Flushed with hope and busy with projects, Uville returned to England, having obtained from the Viceroy the privilege of working some of the abandoned mines. On his way hither he was speaking with a fellow-travel of his plans, his model, and his desire to discover the maker of that model; whereon his fellow passenger, Mr. Teague, said quietly that he was a relative of Trevithick, and could bring them together within a few hours of their arrival. The result of that bringing together was, that in September, 1814, three engineers and nine of Trevithick's engines—Watt and Boulton would not touch the enterprise, and laughed the whole thing to scorn—embarked for Lima and the rich silver mines of Peru. Uville and his charge landed under a royal salute, expectation being raised to its highest, and in due time the engines, which had been "simplified to their greatest extent, so divided as to form adequate loads for the weakly llama, and the beams and boilers made in several pieces, were transported over precipices where a stone may be thrown for a league."

The engine was erected at Lauricocha; in the province of Tarma, and the first shaft of the Santa Rosa mine was drained to perfection. In 1817, Trevithick, hearing of this success, gave up family and fortune, home, wife, and children, and embarked for South America. The whole of Lima was in a ferment. When he landed he was received with the highest honors; his arrival was officially announced in the Government *Gazette;* the Viceroy met him with enthusiasm, and the Lord Warden of the Mines was ordered to escort him with a guard of honor to the "seat of his future labors." When the people found that his engines cleared the mines of water, that the mines yielded double produce, and that the coining machinery was increased six fold, they were beside themselves with joy. Trevithick was created a Marquis and Grandee of old Spain, and the Lord Warden of the Mines proposed to raise a silver statue in honor of this commercial Las Casas, the Columbus of the Cordilleras, this greatest of all living engineers, this most valiant of the Cornishmen, Don Ricardo Trevithick.

Everything looked bright until the revolution began, and the Cornish engineer found himself in a sufficiently disagreeable position between the two parties. The patriots kept him in the mountains, in a kind of honorable captivity, holding him as the Plutus of the war; while the royalists, holding him as precisely the same thing, "as the great means whereby the patriots obtained the sinews of war, ruined his property wherever they could, and mutilated his engines." They sold his shares, and alienated his mines. Trevithick, never very patient, soon determined to put an end to this kind of thraldom, and so made his escape by stealth, ran many dangers, but finally cleared himself and his liberty from the oppressive love and veneration of the mountain patriots. On the 9th of October, 1827, he returned to England, bringing a pair of spurs as the sole remnant of the colossal fortune made—but not realized—in the Peruvian mines. But before he returned he spent four years in Costa Rica, in the countries now so well known as the route of the Nicaraguan transit, and the scene of General Walker's filibuster warfare. Here he mined and projected mines, had magnificent designs, and foresaw many material improvements which afterwards came to pass; but he realized no permanent good for himself out of anything—not though he had an estate with a mountain of copper ore on it, from which he proposed to lay down a railroad to the sea, that so the working of it might be profitable.

TREVITHICK'S MERITS.

After this return from South America, we hear but little of Trevithick. All we know is, that he prepared a petition to Parliament, wherein, after distinctly stating his claims on his country by reason of the superiority of his machinery, he asks for some grant or remuneration. The saving to the Cornish mines alone, by the use of his engines, he calculates to be £100,000 per annum: adding that but for his invention many of these mines, which produce £200,000 per annum, must have been abandoned. Before presenting this petition, Trevithick met with a moneyed partner, who supplied him with the means of perfecting his "never-ceasing inventions." And this was all he wanted, the petition was laid on one side, and never taken up again. In 1833 he died, at Deptford, in Kent, and since then his name has almost died out too. Mr. Hyde Clarke is the only man who has attempted a sustained biography of him, and his biography is not longer than this notice. Though the Institution of Civil Engineers offered a reward for a full and sufficient biography of one of our greatest of the craft, no one has yet come forward to claim it. The reputation of Trevithick has suffered, as often happens, because more practical men took up his ideas and worked them into greater notice. It is well said by one of his friends and greatest admirers, "his reputation has been purposely kept back by the partisans of Watt, on account of the high-pressure engine; of Stephenson, on account of the Thames Tunnel. But as he was clearly the inventor, not only of the high-pressure steam engine and the steam carriage, but also of the boiler, without which (or a modification of which) no steamboat could have ventured to cross the Atlantic, he has undoubtedly contributed more to the physical progress of mankind than any other individual of the present century." The first part of this statement may be questioned; the Stephensons and Brunels having been leading members of the Institution when it offered a prize for Trevithick's memoirs. Thanks be to Mr. Hyde Clarke, Mr. Edmonds, Mr. Neville Burnard, and some others, we may hope for the fuller recognition of his merits in days to come, and the application to them of that famous old motto, the best of its kind, "Let him who has deserved it, bear the palm!"

The Gas Wells of Erie, N. Y.

The Canal Mills of Oliver & Bacon, of Erie, N. Y., are now run entirely by gas from a well sunk on their premises the present season. It is perhaps a month since they erected their derrick and started to drill. They penetrated the rock 493 feet and the entire cost foots up, for drilling, casing, pipe, etc., about $1,500. Their mill contains four run of stones with a capacity of ten barrels per hour. To obtain power for this they have two boilers of forty-horse power each, which are entirely heated by the gas from the well; and they estimate they have enough in addition to produce power for two additional run of stones. On Monday morning last when the water and boilers were entirely cold, they turned on the gas by a stop cock, touched it with a match, and in forty minutes the mill was running. This is getting up steam with a celerity truly astonishing. As to the saving, the mere statement of the cost of coal for the month of June will exhibit it in a more striking light than any words of ours. Their bill for coal, then, for fifteen hours per day running, for that month, was $400. Now they have a constant supply of fuel the entire twenty-four hours capable of producing power to run six run of stones instead of four, at a permanent outlay of $1,500. A slight mathematical calculation will show that if the proprietors of these mills only wish to keep them at the present capacity, and run them the same number of hours, they make a saving of about $5,000 per year, to say nothing of the wages a fireman and other labor which machinery run by coal entails. But if they should wish to add the other two run of stones, or add to the number of hours run with their present capacity, the amount will show still larger. But the enquiring reader will ask, will this supply of fuel last? We can only judge what will be by what has been. The Altoff welf in the southern part of the city, put down eight or ten years ago, is still producing gas as strongly as when first sunk. Its volume is as large, if not larger, than this one immediately under consideration. The wells put down on Ninth street and also near the corner of Holland and Seventh streets, from

which the fuel is furnished to carry on the Petroleum Brass Foundery of Jarecki & Co., and Brevillier's soap works, still hold out with no perceptible diminution. From these facts, we can answer that experience and time, the only criterion, all show that this source of fuel is permanent and reliable. So well convinced of this are all those who have investigated the subject that very many of our manufacturers are preparing to avail themselves of the advantages which this hitherto neglected source of wealth furnishes in the production of fuel for their mills and factories, even for dwellings.—*Erie Republican.*

OF THOUGHT WITHOUT LANGUAGE.

[George S. Burleigh in the Rhode Island Schoolmaster.]

In a former article I offered a few hints aiming to show that language, in its comprehensive sense, was an exponent of power, and the measure of a soul was, everywhere, its ability to express itself in some form or other, by word or sign. But soul can only speak to soul; to be understood there must be a common language, the nerves and motions of a common nature. The moaning of the wind will give the same mental impression as the moaning of a sufferer, but the mind refuses to be moved because it does not find the chord of sympathy; or, if by a play of the imagination, it does shape some tortured spirit in the hollow air, its pain is the genuine confession of relationship.

Words, though beyond computation graphic and vital, for purposes of expression, are far from necessary to thought, though the methods of that thought are inconceivable to a mind not endowed with them. Has it ever occurred to you, thoughtful reader, to imagine what must be the form of wordless thought?—in what fashion a mind that has never learned a language will hold and combine its ideas.

We are so accustomed to that automatic play of association, by which a name carries with it the image of a thing, and a word is always the symbol of some idea, that we are scarcely conscious of any thinking which is not in verbal language. A misty veil of undefined expression so hovers about the very inception of our ideas, that we are apt to pronounce the thought unformed, till the words that express it are brought into some ordered coherence. And yet, if one may trust what is so evanescent, in his own mental operations, he will often discover that what seems to be the laborious evolution of a theme, is only the slow embodiment in words of a picture set clear and vivid by an instantaneous impression on the mind.

When our consciousness is awakened by any telegraphic signal of the senses, the idea so aroused hurries to catch up some word or phrase with which to clothe itself, like a timid bather surprised on the margin of a pool. You lift the eye, and behold a tree, a house, or a river, and unconsciously the mind utters to itself the name of the object. Or you see some unknown thing, whose image, just as vivid in your mind, has yet no name to express it, and words to imply that fact arise immediately, "What is it?" "I know not what that may be."

Picture to yourself the image which an idea must take in the mind of a deaf mute who never heard nor uttered an intelligible sound, nor learned its silent symbol. That he has ideas, quick, varied, and intense, you see by a glance in that speaking face and that earnest, asking eye, which always seem, in their half-sad expression, to mark the efforts of a soul to grasp the unutterable, the yearning of a fettered spirit for the freedom of clear utterance to ease its nameless hunger. How that face lights up at a smile of loving recognition; how that eye flashes with indignation at what seems to the imprisoned soul a wrong or outrage. How the keen, silent questioner looks into your face for the secret of its mobility, for what it means, and by what power we who are blessed with some strange other faculty than theirs, can draw one another, excite laughter and tears, and a thousand actions, all mysteriously moved, all wonderful to that poor, fettered soul, all strange and fantastic as the revels of the northern lights.

To enter the sphere of that ineffable consciousness for an hour, would interest me more than to visit the palaces of all the crowned heads in Europe. To know precisely how, to him who is deprived of one of our finest senses, and one of our noblest faculties, this complex universe of mind and matter stands related, and to feel by what strange methods the remaining faculties of such a mind translate the facts of being which belong to the lost one, into their own language, would be well worth a momentary loss of one's identity.

A blind man attempting to express his notion of scarlet, said it resembled the sound of a trumpet, and he did not intend by it the slang that there was anything "stunning" in the color. We are constantly reminded of the impressions of one sense by the operations of another. To my ear the bass note in music is what a dull black is to the eye, and behind both organs they give the same mental emotion. The reverberations of deep thunder seem like boulders with worn angles, with profiles blunt and irregular, as if drawn by the jerking pencil of the lightning; and one who never had the pleasure of seeing stars from a blow on the head, may get a tolerably correct idea of that kind of galaxy by snuffing at a bottle of volatile salts!

Language is full of the mental effort to report the impressions of one sense by the symbols of another. We say that an apple is sweet, that a rose is sweet, a face is sweet, a strain of music is sweet, and love is sweet, not to mention the saccharine reaction of the "uses of adversity." Here taste, smell, sight, hearing, and a social sentiment, use the same word for that pleasurable sensation experienced by the mind through each distinctive organ. And they are right, though we may fancy it a mere poverty of language, for the equivalent emotion demands a related word, and all words are primarily things of the senses. We assist the organs of one sense by that of another. We open the lips and part the teeth a little when we are eager to hear; we listen and turn the eyes' attention inward, when we would detect a delicate taste, or remember a faded impression. Clairvoyants who see the invisible, shut their eyes and look with their foreheads or the palm of the hand.

But this mutual accommodation of the senses is not so marvelous as it may seem, when we remember that the whole five, six, or seven, as you please, are but one power of nervous perception, specialized into a variety of functions, differentiated, as the learned say, that we may have more perfect work by a division of labor.

The same necessity which developed nerve-contact into sight on the one hand, and hearing on the other, might also express through one of these the sensations proper to the other, when the other was wanting. Some sort of impression of things can be given, without the proper organ. Seal up the eyes of a bat, say the naturalists, and let it loose in a room crossed with wires in every direction, and he will fly clear of them all, as if he had other means of perception as sensitive as the optic nerve.

Laura Bridgman, with neither sight, hearing, nor smell, could detect the presence of a stranger in the room, without contact. Her mind then must have as distinct an image of every person as we have, yet not one of what we call our senses could go to the making up of that image. It could not be form as we know it, nor a voice, nor an odor, but it was itself other than all, exciting emotions of love or hate, gratitude or repugnance, and the thought it excited must have had shape, though it is not easy to imagine how.

In some other world we may get at the bottom of the mystery, and find the one language of which our varied senses are the idioms and provincialisms; but here the suggestion of that common basis is mainly useful as encouragement, to supplement the deficiencies of one gift by the culture of another. If we have not words, then speak in deeds; if we lack vocal melody, sing with the concord of harmonious lives, and let the soul come forth in expression through whatever door the good Father has left open.

Pure Air in Factories.

How imperfectly this requirement is supplied in large manufactories, and what a powerful source of mischief is at work in such places may be indicated by the following facts. In 100,000 parts of pure air, there are rarely found more than 30 parts of carbonic acid; in rooms in cities freely ventilated, the proportion rises to 80 parts in the same volume, while in ill-ventilated rooms and workshops there have been found from 100 to 700 parts, or twenty times nature's allowance. The working classes are exposed to no more fruitful cause of disease than this excess of carbonic acid in the air which surrounds them. When a high percentage of carbonic acid prevails, the circulation of the breathers is generally observed to become enfeebled, the frequency of respiration to increase, and nervous power to fail. Much of the consumption and scrofula of town populations is due to an atmosphere overcharged with this gas. Nothing affects its power for ill so much as an elevated temperature. "Thus even 1 per cent of carbonic acid may be endured at a temperature under 50° Fahrenheit, which at 70° or 80° would be absolutely intolerable." On entering a close room in which a number of persons have been employed for many hours, the atmosphere seems quite unbearable, and we gasp for an open window; while the workpeople, accustomed to the vitiated atmosphere, seem to breathe with ease, and say they do not feel any inconvenience. Is the closeness innocuous because it is not felt? By no means. Acclimatization is dearly bought. By the gradual depression of all the functions, less oxygen is absorbed, and the vitiated air then suffices for an enfeebled organism, just as it would for the respiration of a cold-blooded animal. This kind of vital depression when frequently experienced is destructive to the elasticity and vigor of those exposed to it. In such an atmosphere, rapid and efficient work, to say nothing of comfort and happiness, is out of the question. It is gratifying to find where sanitary regulations have been established, that very decided physical improvement has been effected.

A sufficient cubic space should be allowed to every factory hand; and regard should be had no less to the quality than the quantity of the air supplied.

Plainly, to manufacture perfectly pure air and deliver it on the premises, is impossible; we must, therefore, do what we can to keep it wholesome, by devoting strict attention to ventilation, by the adoption of disinfectants for drains and sewers, so as to kill or render innocuous all organic impurities, and by the preservation of open spaces in and near the great centers of industry. The ventilation of mines should be under legislative regulation, and the most beneficial results would follow, for many lives would be thus saved annually. The ventilation of lodging houses should also be subjected to police supervision in the interests of their casual occupants. Surely the thousands who spend their lives in the workshops and manufactories have even a greater claim on the care of the State.

Much also might be done by the working classes themselves, by the cultivation of habits of personal cleanliness. The fact must not be disguised, that a most baneful consequence of overcrowding is the vitiation of the air by the emanations from the bodies of diseased or uncleansed persons. French scientific investigation has disclosed the unpleasant fact that skin dirt, composed of perspiration, oily matter, and dust contains myriads of microscopic existences, both vegetable and animal. These cutaneous emanations are dissipated in and affect the air; add to these the pulmonary exhalations of consumptive and scrofulous persons, and some idea may be formed of the risk to health incurred by those whose days are spent in an atmosphere so highly charged with organic impurities. "The greater the aggregation of unwashed human masses, the more horrible must be the resulting atmospheric impurity."—*Good Health.*

An Instrument to Measure the Relative Pressure and Velocity of the Wind.

Dr. W. Smyth, of Maidstone, recently read a paper at a meeting of the London Aeronautical Society, describing an instrument which he exhibited, intended to measure the relative pressure and velocity of the wind. "It carries two brass rods resting on friction rollers. At their ends, on one side, are attached two dynamometers of equal known power; at their other ends can be fixed disks or vanes of various sizes to receive the pressure of the wind. Attached to each rod near its center are two arms carrying pencils pressed against this cylinder, round which is fixed a sheet of paper ruled to numerical divisions of the dynamometers. The cylinder being placed parallel to the brass rods, and moved by clockwork at a known rate, the paper receives the marks of the pencil across certain lines, according to the pressure of the wind, like other ordinary anemometers. To estimate, however, the velocity of the wind at these pressures is a matter of great difficulty; we have not a single philosophical instrument in the whole circle of the sciences capable of doing so. And in bringing the instrument in this state before the society I am desirous of having its opinion as to whether I have succeeded in overcoming that difficulty. It, doubtless, has occurred in the experience of many here that they have had the pleasure of observing a field of standing corn waved by the wind; if you give attention to this interesting country sight you will notice that in a level or upland field the waves pass with the greatest regularity in the direction of the wind. Now if we could measure the velocity of these waves, it would be the velocity of the wind; or, again, if we could discover the interval of time from the first stalks of corn to the windward bending to the breeze until the last move at the opposite side of the field, the distance being known, it would give us the velocity. Those who have had still more experience in the country may have noticed, especially in the morning, with the quickening breeze, or again at evening, in the last pulsations with which the wind "sighs itself to rest," its intermittent effects on certain objects. Should they be walking between two groves of trees standing some little distance apart in the direction of the wind, they may have suddenly noticed the quick rustling of the leaves in the trees to the windward, and after an interval of silence the same rustling in the grove further on, the interval representing the velocity of the wind. Now these two vanes are intended to represent two stalks of corn growing apart in the direction of the wind, or two groves of trees similarly situated. And just as the standing corn on the upland lea bends regularly to the breeze, so these two vanes, most carefully adjusted and placed at a known distance, bend successively in the wind and register their movements. Behind each vane is a contact breaker in electrical connection with these two armatures, which have pencils touching the cylinder. Now the moment the first vane bends in the wind, the electrical connection being complete, the pencil makes a mark on the paper, and after a short interval of time, during which the cylinder is moved round some distance by the clock, the second vane is depressed by the wind and registers its movement by the other armature. The distance between the two marks gives the time the pulsation was in passing from one vane to the other, while the other part of the instrument shows the exact pressure of such pulsation. The vanes may be placed from ten feet to a hundred yards apart, depending on the velocity with which the cylinder revolves. For an observatory ten feet would answer best, and would give, perhaps, the most accurate results. It may seem after all that this instrument is not likely to give us correctly the velocity of the wind. The atmosphere is an ocean of such extreme tenuity that we can scarcely think of measuring its fleeting waves. But it is not possible a pulsation of air, after bending this first vane, could acquire an increase or suffer a diminution of its velocity in passing from one vane to the other. If, therefore, when it arrives at both, the conditions be agreed, the effects must also be agreed, differing only in time corresponding to the velocity. Again, this only gives us the velocity of the pulsation and not of the general current. But if we had a table of pressure and velocities from the highest to the lowest pulsations we would certainly be able to calculate the velocity of a current of continuous pressure. But waiving this, when after a storm we have announced to us the enormous pressure of the wind at its highest on the square foot, it would be interesting also to be told its actual velocity, which this instrument to my mind, if well constructed, is capable of doing."

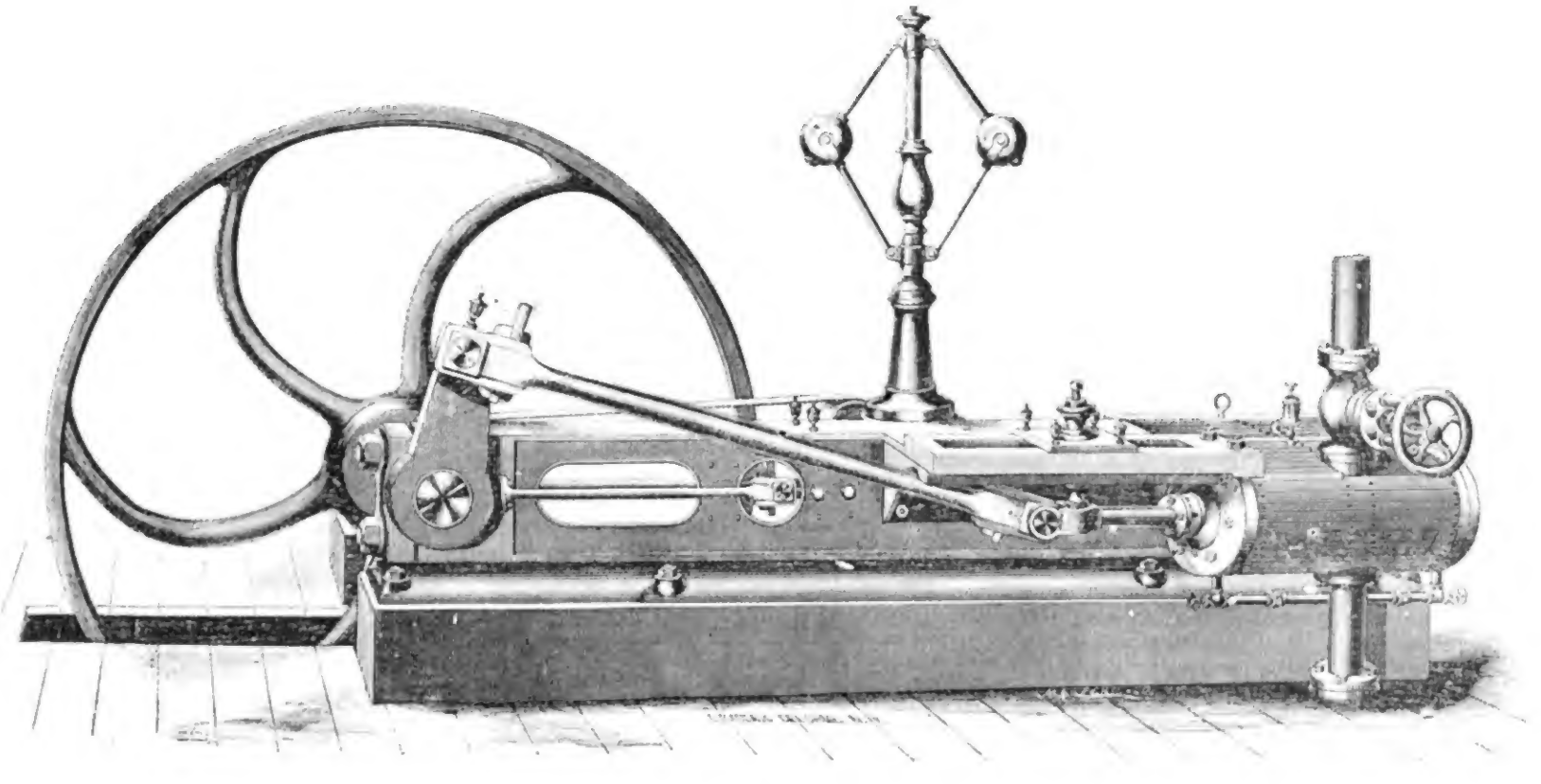
Rescue of Life by Swimming.

M. Farrand, a member of the Board of Health of the city of Lyons, France, says: "The method which has most interested me is that performed by an Englishman named Hodgson, of Sunderland; and after having experimented on and developed it, I recommend it for its precision and efficacy. It consists in holding the drowning man by the hair, and turning him on his back. Then the salvor turns over rapidly with his face upward, places the head of the man on his breast, and thus swims to land. This method is so simple and easy that in an experiment which I had the pleasure of making this autumn with my friend Dr. Bron I was able with ease to practice simultaneously the rescue of two persons more or less motionless. One of them did not know how to swim, and that was a great difficulty, for he grew stiff with fear, lost the floating line, so important to aid us in advancing, and hindered me considerably by lying along my side like an immovable oar on the side of a boat."

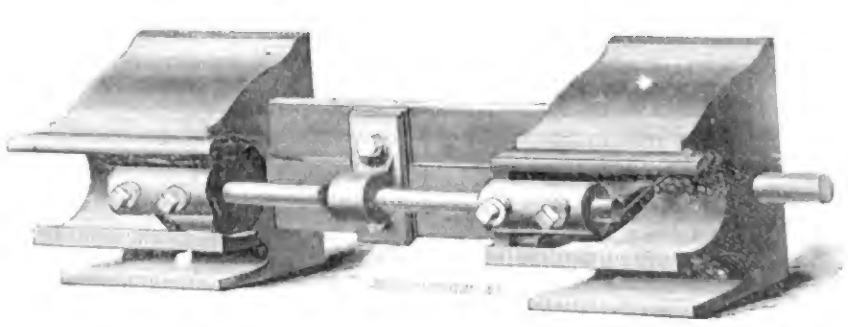
The Rider Horizontal Engine.

The vertical Rider engine which, as well as the horizontal one, takes its name from the inventor of the valve gear, constituting its most prominent feature, was illustrated and described on page 363, last volume of the Scientific American. We herewith present to our readers engravings illustrating the horizontal engine, to which the same valve gear is applied, with the exception of some slight changes in details which we will proceed to describe.

The main valve, instead of being cast in such a way that the cut-off valve ports are quite near together, as in the vertical engine (see Fig. 2 in the article above referred to) is so constructed that they are widely separated, as shown in detail.



THE RIDER HORIZONTAL ENGINE.



The object of this construction, as will be at once comprehended by experts, is to avoid clearance, which is by this means and by the most approved construction of other parts, reduced to a minimum. The two main portions of the main valve are connected by a strong piece of metal cast with them, and which has on the side not shown in the engraving, a strong rib, so that the section of the connecting piece, with its ribs, is T-shaped. The two principal parts of the main valve are thus rigidly connected, so that their faces are kept perfectly parallel. The cut-off valves are two in number, connected by a stem sliding in a guide bolted to the connecting piece of the principal portions of the main valve, as shown in the engraving. On the vertical engine the reader will recollect the cut-off valve is cast in a single piece.

In the vertical engine the valve moves vertically, while in the horizontal engine the two valves move horizontally, the lower parts of the main valve being brought forward and under the cut-off valves, so as to give them natural and easy seats. This is well shown in the engraving.

As some who read this article may not have seen the one describing the vertical engine above referred to, we will recapitulate the description of the valve gear, premising that in the description the words "cut-off valves" should be changed to the singular wherever the vertical engine is meant.

The cut-off valves are seated upon the back of the principal valve, as shown. Their faces are true segments of cylinders, working in corresponding recesses upon the back of the main valve. The ends of the cut-off valves nearest the ends of the steam chest are not square, but are inclined towards each other, forming contours resembling lines of screw threads cut in opposite directions but having the same pitch. The ports in the back of the main valve are cut at a corresponding angle. It is evident that if the cut-off valves be placed so as to cover the ports in the principal valve, a reciprocating motion of the valve spindle will open and close the ports alternately. It is also evident that if the spindle uniting the cut-off valves be rotated in the direction of the widest parts of the faces of those valves, while it has no other motion, both ports will be simultaneously uncovered, and covered again by reversing the direction of the rotation. This rotation is imparted to the spindle from the governor, as the velocity of the engine increases or diminishes, while the reciprocating motion is received from a special eccentric on the crank shaft. The combined action of these motions produces a variable cut-off, cutting off at any part of the stroke. For when the spindle is rotated towards the wider part of the faces of the cut-off valves, which is the case whenever the speed of the engine slackens, the cut-off is retarded, and the reverse takes place whenever the engine runs faster than the correct speed.

The rotary motion is imparted to the valve stem by a toothed segment and rack, not shown, the stem being connected to the rod of the eccentric by a swivel joint. The speed of the engine is determined by weights upon the rack.

This valve gear secures a very sensitive action of the governor. We found on an examination of a sixty-horse power engine of this kind that, while the engine was in motion with full head of steam, it was possible to easily turn the cut-off valves by grasping the stem (only one and one fourth inches in diameter) with one hand. Many have doubted that with such an extent of surface subjected to pressure, such delicate action of the valve can be secured. The explanation of the fact, is based upon another fact, that, so far as we are aware, has not been recognized by writers upon the subject of friction, but which is practically recognized almost daily by everybody. The fact may be thus stated: When a body is moving upon a bearing surface in one direction the increase of friction generated by deflecting its course, is almost nothing in comparison to the tabulated co-efficient of friction between the bearing surfaces as ascertained by experiment when the same body moves in a *single* direction. A simple experiment will convince any one of this. Place a flat-faced body upon a plane surface, and incline the plane until the body resting upon it slides. The angle of inclination is a measure of the static co-efficient of friction, the weight of the body itself being considered as a unit. Now, by moving the plane from side to side, so as to impart a sliding motion to the body resting upon it, it will be found that the body will move towards the bottom of the inclined surface, although the latter be ever so slightly inclined from the horizontal position. This fact is also practically recognized in the drawing of corks, in the sliding of boxes upon floors, and in various other ways that we need not mention, and it may and ought to be set down as a mechanical principle that motion in one direction lessens the friction caused by motion in another direction.

Doubtless this fact might well account for some anomalies in results obtained by experimenters upon the subject of friction; as a slight end thrust backward and forward in a revolving shaft would modify the co-efficient of friction of its bearings.

The steam chest, cylinder, slide, frame, and main pillow blocks of this engine are now cast in one piece, which secures permanent parallelism in all these parts and also saves the labor and expense of fitting joints. Formerly these parts were cast separate and fitted together at a considerable cost.

The parts of the engine are all perfectly accessible, and the bearing surfaces are all accurately calculated to correspond to the weights supported so as to give maximum durability to each.

We are informed that the manufacturers are now extensively putting the Rider cut-off or propeller engines, as the lightness of the friction gives very great convenience in slowing and stopping, and in other respects it is found well adapted to this purpose. A 150 H.P. engine of the kind we have described, may be seen at the Kings Co. Mills, Brooklyn, E.D., N. Y., one of 60 H. P. at the Delamater Iron Works, at the foot of West Thirteenth street, New York, and one of 400 H. P., at Wm. Moller & Sons' sugar refinery, 83 to 93 Vandam street, New York

Many others are in use in and about the city and in other places, and are, so far as we are able to learn, giving good satisfaction. Indicator diagrams taken from several of these engines which we have seen, show a very high degree of economy.

For further information address A. K. Rider, Delamater Iron Works, foot of West Thirteenth street, New York.

Heat of the Gulf Stream.

Mr. James Croll, of the Geological Survey of Scotland, has recently been making a calculation of the amount of heat transmitted by the Gulf Stream, and has come to the conclusion that the total quantity of water conveyed by the stream is probably equal to that of a stream 50 miles broad, and 1,000 feet deep, flowing at the rate of four miles an hour, and that the mean temperature of the entire mass of moving water is not under 65° at the moment of leaving the Gulf. He thinks we are warranted to conclude that the stream, before it returns from its northern journey, is on an average cooled down to at least 40°; consequently it loses 25° of heat. Each cubic foot of water, therefore, in this case carries from the tropics for distribution upwards of 1,500 units of heat, or 1,158 000 foot-pounds. According to the above estimate of the size and velocity of the stream 5 755 ,680,000,000 cubic feet of water are conveyed from the Gulf per hour, or 133.816,320,000,000 cubic feet daily. Consequently, the total quantity of heat transferred from the equatorial regions per day by the stream amounts to 154,959,300,000 000.000 000 foot-pounds.

SCIENTIFIC INTELLIGENCE.

TO RENDER FABRICS UNINFLAMMABLE.

The best agent for this purpose is the tungstate of ammonia. Take a concentrated solution and dilute with water until it has the specific gravity of 1·140, and shows 28° (Twaddle).

The goods are moistened with this solution just before being starched, and they may be afterwards ironed and finished without the least difficulty. Delicate colors are not injured by the tungstate, and goods thus prepared cannot be set on fire, they can be charred, but not ignited.

The tungstate of ammonia can therefore be thoroughly recommended for muslins and children's clothing, and it is especially adapted to render indestructible the dresses of ballet dancers.

DECOMPOSITION OF ALCOHOL BY CHLORINE.

Absolute alcohol can be decomposed by chlorine with artificial light as readily as in the direct rays of the sun. If we pass chlorine into the alcohol in the dark, and then burn a piece of magnesium wire, or employ electric light, the hydrogen of the alcohol immediately combines under a slight explosion with the chlorine. This is another confirmation of the analogy of magnesium light and electric light with the chemical rays of the sun.

FORMIC ACID IN ANALYSIS.

Professor Mohr recommends the use of formic acid in the analysis of minerals. To the aqueous solution after the resolution of the mineral, is to be added formic acid, and the whole must be evaporated to dryness. The silicic acid will remain undissolved, and by heating the residue in a platinum crucible the formciates will be decomposed into carbonates, and can then be determined in the usual manner.

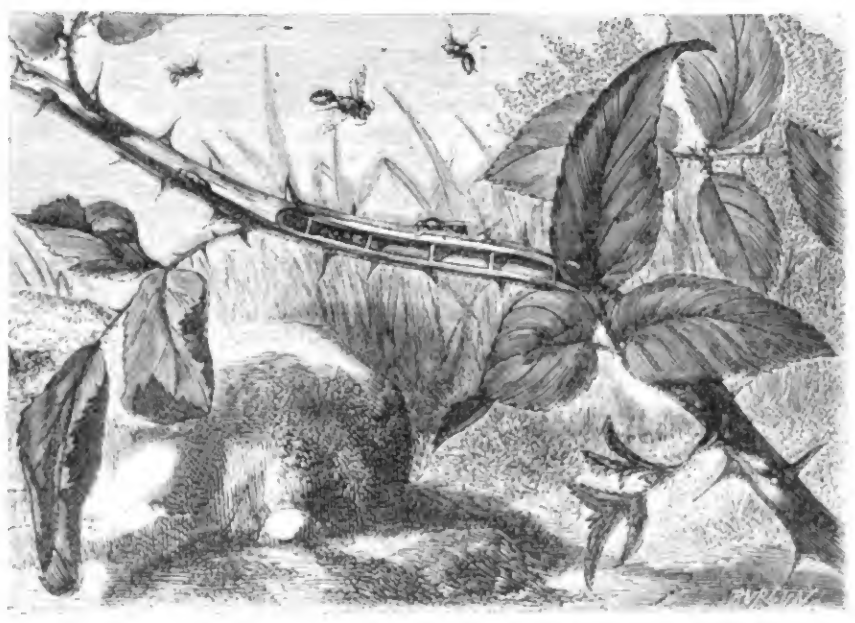
Corsets and Chignons.—Medical statistics in France, it is said, have proved that mortality among the female sex has diminished since corsets have become less fashionable; but that the wearing of the chignons increases diseases of the brain, with frequently fatal results. We imagine that the increased mental disturbance is mostly occasioned by the efforts and anxieties of the fair ones in adjusting their chignons.

[For the Scientific American].

THE HYMENOPTERS.

[By Edward C.H. Day, of the School of Mines, Columbia College].

The Hymenopters are not only the most interesting of insects, but it may even be questioned whether in the variety and nature of their instincts they do not afford us more cause for admiration than do the members of any other group of animals—the Vertebrates, omitting man alone, not excepted. It is true that we do not find amongst them that fitness for close association with the human race that follows from the sagacity and intelligent fidelity of the dog or of the elephant, or from the tractability and docility of the horse; nor do we find the powers of mimicry possessed by the monkeys, nor the articulate utterances of the parrot; but, as mechanics, architects, and engineers these little creatures are unrivaled amongst brutes. Some birds display the exercise of great ingenuity and of patient labor in the construction of beautiful and secure nests, solitary or social habitations, as the case may be. The galleries of the "blind mole" are elaborate works, and the canals, dams, and villages of the beaver are marvels of construction, all the more wonderful from the very slight interchange of ideas that is possible amongst the members of these industrious societies. But all these undertakings sink into insignificance beside those of the Hymenopters.* What artificer is there more exact and yet withal more ready to adapt herself to circumstances than the bee? What manufacturers more expert than the various wasps? What engineer is more daring and more persevering than the ants? An ant, tunneling successfully, as ants have been known to do, beneath a wide South American river, may well laugh at us, hoping in the course of years really to have a bridge between New York and Brooklyn, or deriding as impossible the scheme of an international roadway under the Straits of Dover. Size for size, his race has time and again overcome far greater difficulties. We cannot travel readily from the Battery to Harlem River—the ants at times are impeded on their journeys by what to them are many miles of impediments; we may traverse the surface, or go above it, or beneath it, or even around on the water—the ants frequently have no choice but to mine beneath their obstacles; we have steam and gunpowder to assist us—they have only their jaws and legs; they accomplish a road while we—we ignominiously remain content to travel—hampered by an ever-increasing traffic—stopped by snow or delayed by heat, nipped by the frost, or devoured by—well, look at the coat collar of your neighbor in the car and you will see what causes your own uneasy sensations. The difference is, that the little ant accomplishes at once that which we take years to talk about, and the cause of the difference is that each little ant labors for its community, while each of us!—why we—we have each our own ax to grind. But, says some one, the ant disregards the rights of the property owners along its proposed road. That, alas! is true; but are not Arcade and other railway companies, boulevard commissions, and city corporations sometimes accused of the very same thing? And here again the Hymenopters have the best of it; for ants, like lawyers and scissor-blades, do not cut each other—they allow no monopolies, and know no jobs except to take effect outside their own community. Would mankind but adopt this idea, we should very soon ride the length of Manhattan Island swiftly and in luxurious comfort.



THE SAD CEMONUS AND ITS NEST.

Excuse this digression, good reader, but these Hymenopters are, as we said before, very suggestive of hints to humanity.

The class of Hymenopters may be divided into Stingers and Piercers accordingly as the ovipositor of the female serves chiefly as a poisonous weapon, or as an instrument to aid in the safe deposition of the eggs. This distinction might seem to imply a great difference in the structure of this organ, but this is not the case in its essential features. On the one hand the eggs of the bee, in the act of deposition, pass along the sting as do those of the Piercers, while on the other, the glands that secrete the venom of the former are, according to Newport, equally present in the latter, secreting a fluid that is discharged into the puncture in which the egg is deposited. Both the Stingers and Piercers are interesting to us for other causes than the merely wonderful nature of their habits, as these have frequently a great bearing on our economy, and we may say that in the majority of cases the Hymenopters are our friends. The lower of the Piercers—the Sand-flies, the Horntails, and the Gall insects—are, it is true, our foes—they deposit their eggs in the tissues of plants, and their grubs feed upon the wood and the leaves, or sap the life of the plant by the diseases which their presence engenders. The Ichneumon flies, on the other hand, which lay their eggs in the eggs and caterpillars and living bodies of other insects, are the firmest allies of the agriculturist, his foes are the habitations and store-houses of their progeny.

Among the higher or stinging Hymenopters—if we except the ants—and even they are useful scavengers, we find either producers, as the Honey-bee, or allies, as the various wasps, that store their nests with the bodies of noxious insects. Some of these, however, may be injurious to a slight amount, thus the bee-eating Sandwasp is an undesirable neighbor to the bee-keeper, and the Carpenter-bee gives occasional employment to his human namesake. The lower group of the Stingers are the Ants—above these we find various families of wasp-like insects, such as the Mud-daubers, the Sand-wasps, Wood-wasps, Esca—then the True-wasps, and, finally, the Bees, the highest of the insects.

The nesting habits of these are of infinite variety; we lately gave a description of the Bee-eating Sand-wasp; the accompanying engraving, from Blanchard, represents a European wood-wasp, *Cemonus lugubris*, or the "Sad Cemonus, so called from its uniform dark hue. It makes its nest in the stem of the bramble, a location that, according to Kirby and Spence, is a very favorite one for the larva of wild bees and wasps, and of the ichneumon flies that prey upon them. The partitions of the cells of the nest are formed of the pith of the bramble. There is a similar species in this country, mentioned by Packard, the *Cemonus mornatus*, that burrows in the elder. The food of the larval Sad Cemonus is not specified, but we presume that the nest is stored with some kind of fly. This insect, although the location of its nest is so different, belongs to the same family as the Sand-wasp. It is curious that the various wasps do not in all, nor probably in most cases, kill the insect they carry to their nest. They merely benumb it by their sting, so that, when the egg laid with it hatches out, the larva may find its food fresh. It has even been questioned whether the poison may not have a preservative effect, preventing decomposition in case of the death of the insect stung.

The strength of the Hymenopters is remarkably evidenced by the large size of the insects they capture. One of our native species makes the cicada, or "locust," its prey. Although this burrowing wasp is a large insect—in fact, a medium sized specimen now before us is longer in body than the locust, yet placed by the side of its prey the difference in bulk is remarkable, and it is almost incredible that it should so readily secure such a powerfully flying and strong insect; yet we can corroborate the observers whom Packard cites.

* After this article was written, on reference to Kirby and Spence, we found that this idea of the superior building instincts of insects was almost a plagiarism of theirs. It was not wittingly so, and it is well as it is—for if our limited observations have brought us to the same point that their superior knowledge led them the reader will the more readily acquit us of all exaggeration, and of a wish to elevate these "little objects" to a rank beyond their just claim."

Improved Mode of Working Artillery.

The war-cloud that has recently threatened Europe has assumed such proportions as to set military engineers to serious consideration as to the probable demand for new engines of warfare.

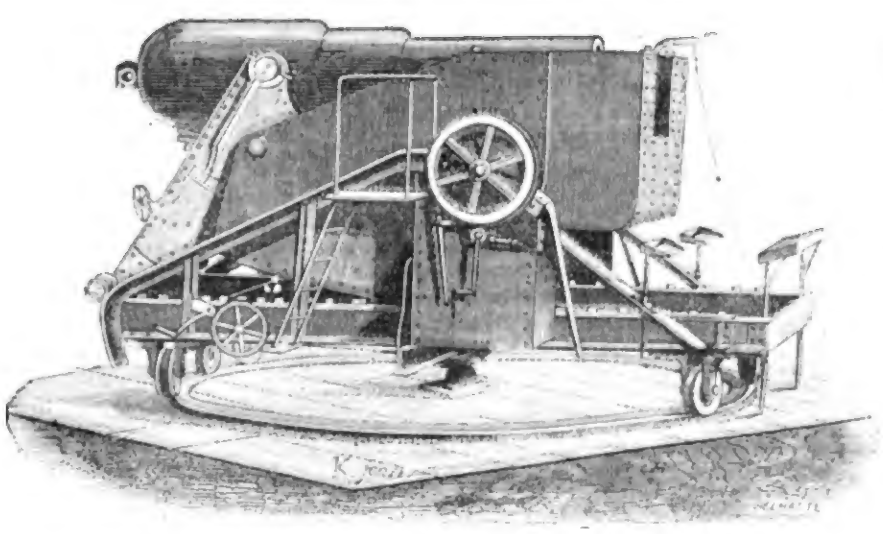
It is perhaps safe to say that modern advances in military engineering have done much to prevent nations from resorting to arms in the settlement of their difficulties. So terribly destructive are the agents which man has devised for the conduct of war that the responsibility of nations in a resort to arms has been fearfully increased. Let us hope that in the end war will become exterminated, and the reign of peace commence upon this blood-stained earth.

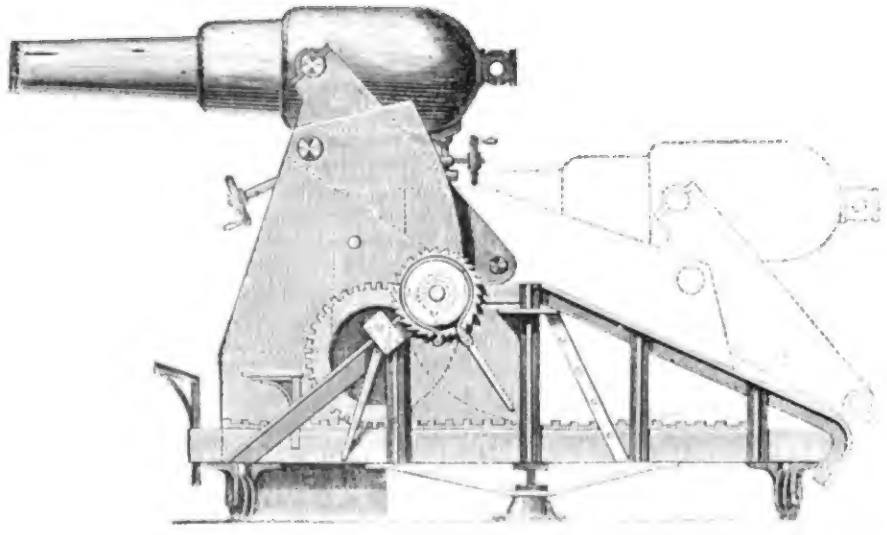
Among the most prominent of recent improvements in this field, and one which will probably receive a thorough trial in the event of a European war, is the Moncrieff system of mounting and working guns for ships, and for coast defenses, illustrated herewith. It is proper to say, however, that the general principle adopted by Capt. Moncrieff has been adopted, and by many thought to be utilized in even a more efficient manner by Capt. Eads, a celebrated American engineer, than by Capt. Moncrieff.

The method of Capt. Moncrieff, as described by himself, is as follows:

"The system is indeed a simple one; it does not require either brute strength or heavy expenditure for its application; nor does it need mighty forges to weld iron walls to protect our guns and gunners; it only calls to our aid the simplest and most docile forces of nature. Instead of trying to meet force by force, I make my guns bow to the inevitable conditions which science has imposed; and instead of wasting energy, money, and skill in attempts to raise a buttress against the new artillery, I employ the hitherto destructive force of recoil to lower the gun below the natural surface of the ground, where it can be loaded and worked in security and in comfort; and, at the same time, I have made that destructive force so much my servant that I compel it at my pleasure to raise the gun again into the fighting position whenever it is required.

"In 1855, while watching the interesting operations before Sebastopol, and endeavoring, as well as I could, to understand the conditions under which the siege-artillery was used, I conceived the idea which is now realized. It was then that I saw the value of earth and the importance of simple expedients. It was plain that the weak point of a battery was the embrasure, which formed a mark to fire at, an opening to admit the enemy's shot, and required constant repair even from the effects of its own gun, which, in firing, injured the revetments of the cheeks. I also came to the conclusion, in my own mind, that a remedy for some of these defects could be devised. Afterwards I worked at various plans, of which sketches were made or models; but each design had defects which discovered themselves to me as my experience increased.





THE MONCRIEFF SYSTEM OF WORKING ARTILLERY.

"The real difficulty of the thing arose from the necessity of providing for the enormous strain of the recoil. These early designs which were sometimes excellent in other respects, broke down at this difficulty, and although some of them no doubt would answer with small guns, they were not calculated to meet the tremendous recoil of large rifled pieces. At last I hit on a simple principle that would meet this difficulty to advantage, the interposition of a moving fulcrum between the gun and platform. Then I knew that the problem could be solved; and, feeling the great importance of the subject, I resolved to devote my efforts to working it out completely. While directing my attention to this simple and then apparently obscure matter, I was neither an idle nor dis

interested watcher of the progress of artillery. Every step in advance was riveting the certainty in my mind that the system would one day be required, and with this conviction I refused to allow either discouragement or delay to make me desist. I shall now endeavor to explain shortly the system which bears my name, as far as it relates to coast defense. It consists of three parts: 1st, The mechanical principle of the gun carriages. 2d, The form internal and external of the batteries. 3d, The selection of ground for placing the batteries, and the arrangement for working them to the greatest effect; or, in other words, the tactics of defense for positions where the system is employed.

"The principle on which the carriage is constructed is the first and most important part of the new system, because on it depends the possibility of applying the other parts. This principle may be shortly stated as that of utilizing the force of the recoil in order to lower the whole gun below the level of the crest of the parapet so that it can be loaded out of sight and out of exposure while retaining enough of the force above referred to, to bring the gun up again into the firing or fighting position. This principle belongs to all the carriages; but the forms of these carriages, as well as the method in which this principle is applied, vary in each case. For instance, in siege guns, where weight is an element of importance, the recoil is not met by counterpoise. With heavy garrison guns, on the other hand, which, when once mounted, remain permanent in their positions, there is no objection to weight. In that case, therefore, the force of gravity is used to stop the recoil, because it is a force always the same, easily managed, and not likely to go wrong; and as these carriages are employed for the most powerful guns, it is a great advantage to have the most simple means of working them.

"It has been already mentioned that the principal difficulty arose from the enormous and hitherto destructive force of the recoil of powerful guns; and here I shall point out the manner in which that difficulty is overcome. That part of the carriage which is called the elevator may be spoken of and treated as a lever; this lever has the gun-carriage axle at the end of the power arm, and the center of gravity of the counterweight at the end of the weight arm, there being between them a moving fulcrum. When the gun is in the firing position the fulcrum on which this lever rests is almost coincident with the center of gravity of the counter-weight, and, when the gun is fired, the elevators roll on the platform, and consequently the fulcrum, or point of support, travels away from the end of the weight arm towards the end of the power arm, or, in other words, it passes from the counter weight towards the gun. Notice the important result of this arrangement. When the gun is fired, its axle passes backwards on the upper or flat part of a cycloid. It is free to recoil, and no strain is put upon any part of the structure, because the counter weight commences its motion at a very low velocity. As the recoil goes on, however, the case changes completely, for the moving fulcrum travels towards the gun, making the weight arm longer and longer every inch it travels. Thus the resistance to the recoil, least at first, goes on in an increasing progression as the gun descends, and, at the end of the recoil, it is seized by a self-acting pawl or clutch. The recoil takes place without any jar, without any sudden strain, and its force is retained under the control of the detachment to bring up the gun to the firing position at any moment they may choose to release it. The recoil, moreover, however violent at first, does not put injurious horizontal strain on the platform. In my experiments at Edinburgh with a 32-pounder; I found that so slight was the vibration on the platform caused by firing that the common rails on which the elevators rolled in that experiment, and which were only secured in the slightest manner, did not move from their position, nor even when heavy charges of double shot were used did sand and dust fall off their curved tops.

"At a still earlier experiment made with a model of a 95-cwt. gun, the model was fired on the ice with excessive charges, and nevertheless remained stationary. This valuable concomitant of the system cannot be appreciated fully without referring to the difficulties that have been experienced, and are now felt, in getting pivots, platforms, etc., on the ordinary system, strong enough to mount the new artillery, where the recoil is stopped by friction applied directly by means of what are technically called "compressors," attached to the platform; these difficulties, that the first two 12-tun guns on ordinary carriages that were fired in casemates (which happened a few months ago) at Gilkicker Fort, were both *hors de combat* the first shot. This alarming event showed that, with all the experience of ancient and modern artillery (and the carriages referred to were the legitimate exponents of the results of that experience), there was still room to doubt whether the problem of meeting recoil had been at that time completely solved by the existing system. The accident referred to was serious, because it might occur in action, and, in that event, would disable the gun *pro tempore* as completely as if it had been dismounted by a shot.

"Some credit may be claimed for the new system on the ground that it provided a carriage for a heavy piece of artillery on an entirely new principle, in which not a single part was copied from anything that had been formerly used, dealing with new conditions and performing new functions that no other carriage had done, and yet this new carriage (the first complete one of its kind) has now fired two hundred rounds. This practice has been carried out with only a few accidents, which pointed to defects in the gearing, which were easily remedied. By treating this violent force in the manner above described, a good deal of the strength that is required in other systems becomes unnecessary, and, at the same time, the recoil, however violent, can not only be met, but utilized. Together with the carriages there are some improvements of minor importance, such as trunnion pointers, reflecting sights, graduated racers, and so on, which it would be out of place to discuss at present, but which contribute to the efficiency and completeness of the system, and are more or less required for carrying it out as a consistent whole for coast defense."

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Inertia.

MESSRS. EDITORS:—Misnomers are the stumbling-blocks of philosophy and science. Somebody says that "language was not made; it *grew*." And it *grew*, not to express the ideas of philosophers, metaphysicians, and scientists, but with the wants and advancement of the common people. Philosophers, in attempting to express their uncommon ideas by means of common language, have been compelled to adopt such words as most nearly express their meaning, and in doing this have frequently been most unfortunate. The word employed, unless the greatest care is taken in its use, always carries with it more or less of the common meaning or acceptation, and this common acceptation not unfrequently carries with it a popular error, which the most discriminating, painstaking thinker frequently experiences great difficulty in eliminating. As a familiar illustration it is doubtful if the highest degree of astronomical science ever enabled any one to use the expression "sunrise" without an indefinite impression similar to that which he received in his childhood from the phenomenon, and from the word used during his whole life to express, not the *fact*, but the apparent phenomenon. To be sure the astronomer does not allow language in this particular instance to vitiate his thinking; and, indeed, language expressing apparent phenomena does not perhaps largely mislead real thinkers. But as such language not only conveys but perpetuates the errors of the superficial, or those who merely observe and consider phenomena, without reasoning as to their connection or order, so erroneous philosophical expressions, or expressions first used scientifically to denote a mistaken idea, not only convey but *perpetuate* the error which gave rise to them.

The writer has observed the discussion upon the subject of inertia which has taken place in the SCIENTIFIC AMERICAN during a year or so past, and is desirous of aiding in the attainment of correct views upon this subject. It is his view that the use of the word inertia is one of the best illustrations of what has been set forth above than any other word to be found in the language of science, and that this word is more unfortunate, more unfit to express the real truth, and more vicious in the errors carried with it and perpetuated by it than any other word used in scientific discussion.

The idea of philosophers seems to have been that matter has no power to move itself, no power to stop itself, no power to change the direction of its own motion, no power to retard or accelerate it; and this *absence* of power was denominated inertia. In other words, it is not a property but the *absence* of something which is sought to be named. The first thought that strikes one in this connection is the vastness of the category which a nomenclature of negatives would necessitate. Suppose we attempt to carry it out, and say that matter has no power to illuminate itself, therefore it has a property of *non-self-lumination;* that it has no power to organize itself, therefore it has the property of *non-self-organization;* it has no power to give life to itself, therefore it has the property of *non-self-vivification*, etc. It is not necessary to enlarge upon this. Names negative certain particular things, as the word darkness negatives the word light, or the word cold negatives heat, as also general words of a similar character which negatives all existences—such as *nothing*, *space*—are necessary. Yet even with these there is great danger of considering them as positives; and when a negative is once assumed as a positive there is no end to the confusion which follows. The writer recollects an instance of a village sage, whose openly avowed atheism was based upon the impossibility, even to the Almighty, of making the universe out of *nothing;* not that he had any idea of the perpetuity of matter, but his question to him all important and unanswerable was, "Where did God get his nothing?"

But while negatives are, in the construction of our language, indispensable, and if we are always careful not to treat *nothing* as a thing, and do not vitiate our reasoning, yet the notion of *negative properties*, properties of *not* doing or *not being* something are absurd and fatal so long as we continue to use them. Words, says the grammar, "are certain sounds used by common consent as *signs of our ideas*." Words growing into a language used by people whose ideas are erroneous convey erroneous ideas, and they not only perpetuate but become the stronghold of the errors in which they had their origin.

The word *inert*, says Webster, "is derived from the Latin *in* and *ars* (art). The English sense being drawn not from *art* but from the primary sense, *strength* or *vigorous action*;" and he defines it in these words, "Destitute of the power of moving itself, or of active resistance to motion impressed, as matter is *inert*.

Inertia is a substantive derived from the adjective, and means the quality of being *inert*. Of course matter does not and cannot move itself. The proposition that matter could move itself would be logically absurd. It is an example of that too frequent error of making the subject and the object of a proposition the same; always absurd except in the loose common mode of expression which may be properly enough used to convey the idea of one portion of a compound acting upon another portion of the same compound, as when we say one cuts himself, a proposition confutes itself, a machine breaks itself. When we speak of things not compound we can properly say it *does* or it *does not* act, but must not say it compels itself to act; and when we say the same thing of both the subject and object of the same transitive verb, however the usage may be sanctioned, we talk nonsense.

But it may be said, "*inertia* merely means that matter does not move without something to move it or cause it to move," and this brings us to the discussion of both phenomena and facts of motion in connection with matter. When we say that matter does not move without something to move it have we done anything more than to enunciate a portion of the great general law—the law of all laws—that nothing in nature takes place without certain antecedent conditions which it is the true province of philosophy to determine? It is a fact that matter does not move, or, being in motion, doev not move more rapidly or more slowly or does not change direction without certain conditions for the motion or the change; but is this fact any more worthy to be called a property and to have the name *inertia* assigned to it than the fact that coal will not burn without heat? than oxygen is entitled to be considered as a property and to be named *non-self-combustibleness?*

But, it may be urged, the word inertia has been used so long and so extensively and is so interwoven with all works and discussions on the subject of physics that we cannot dispense with it, and we can, after carefully defining it, retain it in our formulas and use it in our thinking and our talking without consequent error.

The answer is that it is impossible. The word has absolutely no meaning, and can never be safely used unless as we use a letter in algebra to denote a quantity simply and nothing more.

Suppose now we drop the word inertia with its errors and absurdities and make an effort to enunciate the *positive* facts relative to motion and matter. The first fact is that matter *does move;* not move *itself*, as we have said, but it *moves*. Of course it moves, as every phenomenon in nature takes place, in uniform routine, or, as is generally said, according to unvarying laws.

The historic apple, the descent of which, under the eye of the philosopher, suggested meditations which resulted in the discovery of the law by which the universe is guided, was but matter moving; not *moving itself*, but *moving*. Newton did not discover the fact that matter moves. Every schoolboy knew that as well as he. The philosopher discovered the mode or manner or law of its motion. The *law* does not move the matter. It is merely the enunciation of the *manner* of its moving. Matter moves always and everywhere. It moves faster, slower, or changes direction, according to the conditions present. And these conditions for the motion or change of motion are as numerous as the possible combinations of chemical substances or the physical properties of elementary substances. Why does matter thus act? All philosophy seems to answer that matter has ever acted thus, and that it ever will act thus. That matter and its laws or modes of action are eternal. But of this we can know nothing. The universe as it is moves on from the greatest to the most minute of its operations, from systems of worlds in their incomprehensively vast career down to the development of an animalcule is simple matter *moving;* sometimes suddenly and with resistless and distinctive force; sometimes almost imperceptibly, gently, and beneficently. Supply the necessary conditions for any particular motion, and that motion always begins. A minute spark is dropped by a careless hand in a powder magazine, and, from the introduction of just this little particle of heated substance, particle springs away from particle, molecule from molecule. What was before a solid changes to heated gases, and matter moving shatters a mighty ship to atoms or lays a city in ruins. Wooed by the sun and air "the mists go up and water the earth."

What then becomes of inertia? It is not only absurd and meaningless, but even so far as it is claimed to have a meaning it is false. In no sense can matter be said to be inert. Let us study its conditions; we shall not find them to be capricious. No thinking man can doubt that millions of millions of ages ago matter moved toward other matter as it now does when not prevented, with a force directly as its mass and inversely as the square of the distances, or that oxygen would not combine under certain conditions in the same proportions as now with hydrogen to form water. In one continued round of condition and sequence the operations of nature have proceeded. Our highest pleasure as well as our most useful employment is to study and to utilize them; but all our theories and experiments must be based not upon the time-honored error that matter is inert, but upon the momentarily demonstrated fact that all matter moves.

Albany, N. Y. PHILOSOPH.

A Theory of Thunder.

MESSRS. EDITORS:—It occurs to the writer that the cause assigned in the text-books for the phenomenon commonly called thunder, is neither satisfactory nor correct. In substance, it is this: The electricity in passing from one cloud to another, or to the earth, makes a vacuum along its course; and what we call thunder is the result of the subsequent collision of the divided atmosphere.

This is perhaps true, if we accept it as a statement of a result; but I think it affords a partial explanation only. My theory in regard to this phenomenon is this: The electricity in passing from one cloud to another, or to the earth, decomposes the water in the cloud into its component gases; and the great heat of the electricity ignites and explodes these gases, and reforms them into water.

If something like this does not occur—if an explosion does not take place—I cannot understand why the mere passage of electricity, either through the cloud or through the open

air, should not be quite as noiseless, as the passage of any solid body would be through either or both of these media.

The violence of the explosion depends on the volume of electricity set free, and the amount of water decomposed; or, if a volume of electricity pass through a perfectly dry medium, there could be no decomposition of water, and consequently no detonation.

And may not the fact that we can see electricity at all depend upon the combustion of gases evolved in the decomposition of water in the atmosphere? R. S. MERSHON.

The Bachelder Extension.---Interesting Letter from the Commissioner of Patents.

MESSRS. EDITORS:--Referring to the communication in relation to the Bachelder extension, copied in your issue of the 16th ult., from the N. Y. *Sun*, I think it proper to say that, while it may not be expedient for a public officer to attempt to vindicate himself in the newspapers against criticisms upon his official action, the direct charge of this unknown correspondent, that the Commissioner of Patents "is using all his influence to get the Bachelder patent extended for ten years," requires notice.

I desire to say that this statement is absolutely untrue; that until I saw this communication I did not know that an application to extend the Bachelder patent was before Congress; or, if I had ever heard of it, I had forgotten it; that I have never spoken or written to any one concerning said extension, nor has any one, that I remember, ever spoken or written of it to me; that I have never heard or decided, and shall not hear or decide any application for the extension of any patent in which I have ever been retained or have acted as counsel; that my views upon the subject of extensions are set forth in several printed opinions, which speak for themselves; that I do not now own, and never did own any interest whatsoever in any patent or application for a patent, except that, nine years ago, I received a small interest in a patent as security for moneys advanced to a poor inventor to enable him to develop his machine, and, in that case, I lost my money, and the security proved worthless.

I think I may safely add that if, during my administration, any man should so far forget what is due to himself, this office, or the present incumbent as to attempt to influence me corruptly, he will neither be any former client of mine nor any one who comes from that portion of the country in which all the years of my professional life have been spent.

SAMUEL S. FISHER.

Washington, D .C., July 16, 1870.

Interesting Patent Decision.

MESSRS. EDITORS:—Inclosed we send you a newspaper notice of the recent decision promulgated by Judge Woodruff at the recent session of the United States Supreme Court, at Canandaigua, relative to our "Soft Tie" patent suit *vs.* J. M. Hurd Paper Bag Co.

This patent is one of those we have obtained through your house, and although well fought by the defense, seems to have been impregnable. We congratulate you.

Canajoharie. N. Y. ARKELL & SMITHS.

DECISION.

James Arkell *et al vs.* The J. M. Hurd Paper Bag Company. For infringement of patent. Decision in favor of plaintiffs for amount of damages and injunction. J. C. McClure for plaintiffs; D. Wright for defendants.

The Judge, in his written discourse, says the plaintiffs (Arkell & Smiths) have the sole undoubted right, by any means, for the "soft tie" sack and that the patent given to Hurd was a "mere artifice" to appropriate the right of the plaintiffs.

Wanted---Free Trade in Boiler Iron.

MESSRS. EDITORS:—I see in your issue of 9th inst., on page 20, current volume, under the heading," "How to Make a Perfect Boiler," that we are to "use the *best American iron*." And then says the writer, "Thanks to protection, we can now produce an article equal to the best in the world." If *protection* don't make the boiler any *better*, please give us a little "free trade in ours out West, and we will get "the *best* in the world," *a great deal cheaper* than we now get the "equal."

Champaign, Ill. THOS. B. GREGORY.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of May, 1870:

During the month, 495 visits of inspection have been made, and 861 boilers examined, 792 externally and 251 internally, and 135 were tested by hydraulic pressure. The number of defects in all discovered, 427; of which 59 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 27—3 dangerous; fractures in all, 77—11 dangerous; burned plates, 42—6 dangerous. These defects not unfrequently arise from mismanagement in blowing down (or out) boilers.

Our attention has been called to several cases were boilers were leaking badly in the joints about the furnace, and around the ends of the tubes. On inquiry it was found that the boilers were blown down with steam up, fires burning, and the furnace and bridge wall nearly red hot. It will be seen at once that such practice cannot but injure a boiler; for, as the water is blown out, the sheets become very hot, and any sediment that remains in the boiler will become hard and fixed on the sheets. Many boilers are ruined in that way. First, draw the fires, and then open furnace doors and allow a current of air to pass through the flues or tubes of the boiler. Blow off with little or no pressure of steam. Parties who are troubled with leaky boilers, and loose tubes, will doubtless find, on examination, that the boilers are blown down with steam up, and fires on the grates.

Blistered plates, 39—2 dangerous; cases of incrustation and scale, 78—4 dangerous; cases of external corrosion, 28—5 dangerous; internal corrosion, 6—2 dangerous; water gages out of order, 25—4 dangerous; blow-out apparatus out of order, 9—2 dangerous; safety valves overloaded, 45—6 dangerous; pressure gages out of order, 80—6 dangerous; boilers without gages, 1; broken braces and insufficient staying, 9—3 dangerous; boilers condemned, 3. We are not a little surprised at the gross carelessness found in the management of safety valves. They are often put in most inaccessible places, as though they were of little or no account; they become corroded in their seats, and of no practical value whatever.

We recently found one on a steam pipe directly underneath a second-story floor. The floor had settled, and was resting upon the lever in such a manner that no pressure of steam which the boiler was capable of sustaining, could have raised the valve. This is only one of many similar instances which have come under our notice. Engineers should, for their own credit, and the safety of those who are employed in manufactories, examine frequently and carefully all the attachments to their boilers, and especially the safety valve.

[For the Scientific American.]

EXPERIMENTS WITH HYDRATE OF CHLORAL.

BY DR. F. A. HOWIG.

June 17th, 1870.—Weather clear and warm; temperature of the room, 74° Fah. At precisely 4 o'clock P.M., three hours after a hearty dinner, I dissolved 10 grains of the salt in one ounce of sweetened coffee and drank it. In 6 minutes after I lay down; in twenty minutes experienced a sensation of drowsiness; remained passive and quiet, conversing a moment occasionally, the desire to sleep continuing to become more marked; experienced no unusual feelings except languor, nor became at any time unconscious, but was aware of sounds in the street near and about the house. At 5 o'clock arose and sat up in a chair for a few moments but still feeling drowsy; lay down again for another half hour, when I again arose and went about my usual business.

June 18th.—Weather clear and warm; temperature of the room, 80° Fah. At half-past 4 P.M., three and a half hours after a moderate dinner, I dissolved 16 grains of the salt in about two ounces of sugar and water, and drank it. In ten minutes after I lay down; experienced some drowsiness immediately, and at 5 o'clock was in a sweet sleep and unconscious, remaining so (says the attendant) about 15 minutes—could easily be aroused at any time—the breathing and rest seeming natural. I observed no unusual symptoms except a slight fullness of the veins and arteries in the temporal region; arose at 20 minutes to 6 as if from ordinary sleep, with skin moist and pulse perfectly natural. I had anticipated some nausea, but experienced none.

June 19th.—Weather clear and warm; temperature of the room, 80° Fah. Lunched at 2 P.M.; at 5 o'clock dissolved 20 grains of the salt in 2 ounces of brandy and water sweetened, and drank it; sat up in a chair during the following 20 minutes. The pulse continued gradually to rise from 70 to 94, and the skin was perceptibly moist. No other unusual symptoms whatever. At the end of 20 minutes a perceptible drowsiness coming on I lay down, and in perhaps 40 seconds was asleep. Slept sweetly but not very soundly for fifteen minutes; arose as the clock struck 6, feeling partially refreshed, and pulse nearly natural.

June 21st.—Weather clear; temperature of the room, 71° Fah. At half-past 1 o'clock P.M, five and a half hours after a light breakfast of toast and coffee, I dissolved 26 grains of the salt in about three ounces of brandy and water sweetened, and drank it. In six minutes began to feel its effects by a marked lightness and wildness of the brain. Continued to walk about for twelve minutes until such was the intense desire to sleep that I lay down. I now examined the pulse, and found it rising, and as near as I had power to recollect it was 84. I almost immediately became semi-unconscious, and remember of experiencing an inordinate desire to laugh aloud—the attendant says *did* laugh aloud at intervals—and that much restlessness was exhibited. No disagreeable feelings of any kind were present. The senses were somewhat confused, though consciousness seemed lost as in natural sleep. I had given orders to test the sensibility of the muscles, but other evidence of sensation rendered it unnecessary. I was spoken to three or four times, and rational answers were always obtained, though of this I have only an indistinct recollection; arose of my own accord at 10 minutes past 3 o'clock feeling partially refreshed. I now examined the pupil of the eye, and found it much dilated. No nausea occurred, and as late as 5 o'clock felt no desire to eat although having fasted so long.

July 8th.—Weather cool; temperature of the room, 70° Fah. At half-past 2 o'clock P.M., one and a half hours after a moderate dinner of vegetables and fruit, I dissolved 20 grains of the salt in 1½ ounces of peppermint water (sweetened) and drank it. The pulse now rapidly rose from 73 to 95. I continued walking about the room for fifteen minutes, experiencing no unpleasant sensations whatever, and only a slight drowsiness. At 15 minutes to 3 o'clock I again dissolved 15 grains more of the salt in about the same quantity of mint water (making 35 grains in all), and drank it. I still continued walking about—approached the mirror and found the pupils of each eye strongly contracted, although the room was partially darkened. Feeling an almost overpowering sense of drowsiness coming on, I was now obliged to note the symptoms rapidly while consciousness remained. I again examined the pulse, and found it 100. It quickly reached 112, and remained from 111 to 112 for six or eight minutes. At 8 minutes to 3 o'clock the pulse was 111, and at this time I had not power to stand erect, but reeled like a drunken man, and therefore lay down at once, and in a few moments was unconscious unless aroused. From that time time until 6 o'clock P.M. I have only a faint recollection of what occurred; remember of changing my position from one room to another, and of the attendant pricking my ears, which seemed more annoying than painful. Although consciousness and memory were lost for the time, yet sensation was always present in a great degree, as the attendant says, pricking the hands, feet, or ears invariably aroused me, and that evidences of pain were exhibited. I was called to tea at 7 o'clock; felt very little desire for food, but experienced no unpleasant sensations whatever. The drowsiness had not entirely passed off when I retired for the night at 10 o'clock. P.M. I may remark that on being called at 7 o'clock the pupils of the eye were very much dilated, and continued so for some time.

Banishing Nitro-Glycerin.

The peculiar danger of using nitro-glycerin, as of gut-cotton and all other nitrate compounds, except gunpowder, are unavoidable, because the sources from which they arise are totally unknown. The characteristics of gunpowder are understood. It is a compound stable and trustworthy enough; never exploding, except under conditions which everybody knows. But nitro-glycerin—to speak in the present connection solely of that article—has tricks wholly beyond the comprehension of the ablest chemists. Though under some circumstances it is less liable to decomposition than gunpowder, under others, which cannot be foreseen and provided against, "it goes off of itself." In a word, it is an "unstable compound," in the language of chemistry, resembling in that respect the powders made from chlorate or picrate of potash, chlorate of nitrogen, and other products in which the nitrogen is not held in a grasp sufficiently firm by the other agents with which it is united. Some of the dreadfully disastrous nitro-glycerin explosions that have occured may be directly traceable to the carelessness of employés, but the most of them undoubtedly have resulted from causes inherent in the composition of the substance. It is a great misfortune that this should be the case, for if nitro-glycerin could be depended upon with the sense of security as gunpowder, it would entirely supersede the latter in heavy blasting business on land and under water, being far the superior of gunpowder in cheapness and efficiency. Since these mysterious perils accompany the use of nitro-glycerin, we have no hesitation in suggesting that its manufacture and employment should be forbidden by legislation. It chills the blood to read, as we so frequently have to, of men blown to atoms, rows of houses shattered to the ground, and devastation spread far and wide by the explosion of factories by a can of this terrible agent of death. The loss to the world by its banishment will be slight, after all, compared to the dangers resulting from its use, for in gunpowder we shall still possess an agent powerful enough to remove mountains, and do all the gigantic work required by the engineering genius of the age.—*N. Y. Journal of Commerce.*

How to Make Tin Fruit Cans.

In reply to an article on fruit cans, published on page 400, last volume of the SCIENTIFIC AMERICAN, Mr. F. M. Mills, a correspondent who has much experience, writes us as follows:

"I take the best No. 14 tin plate and solder with block tin. I have used some of the cans four years, and they are not rusty inside or out, and they are just as good as when first used. About the fruits being poisoned by the cans, I don't pretend to know, but if they are I would just as soon eat it as that canned in glass with zinc tops. I have used six glass jars, but don't want any more. The fruit canned in good tin cans keeps its flavor one quarter better than in glass. I never lost any fruit canned in tin cans; I have never seen any mold in them as I have in glass cans. I have canned peaches, cherries, tomatoes, blackberries, raspberries, etc., and they keep all right. I don't believe there is any danger if the cans are made of good tin and soldered with tin."

A NEW DODGE IN HAIR DYES.

When iodide of potassium is added to a solution of salts of lead under ordinary circumstances a beautiful yellow precipitate of iodide of lead is immediately formed.

A correspondent of the *Journal of Pharmacy* having received a notice, from a party in New York who manufactures hair-dye, containing a caution to those who buy "hair restorers" "to have their druggists first test them for lead and mercury by means of the iodide of potassium, suspected the secretion of a cat beneath the meal, made an examination of the article, and communicated the result to the editor of the journal alluded to. It was found that although the preparation contained lead, the test recommended by its manufacturer would not give any indication of the presence of the poison, the reaction being in some way adroitly masked. A test with sulphuric acid, however, at once revealed its presence by the formation of a heavy, white, insoluble precipitate of sulphate of lead.

TO REMOVE SILVER STAINS.—One of the best ways is to wash the spots with a concentrated solution of sulphate or chloride of zinc and to rub the worst places with metallic zinc. Then rinse in pure water and complete the washing with soap. Ink stains can be removed in the same way.

Improved Nut Lock.

Many devices having for their object the secure locking of nuts have made and are now making their appearance. The merit of a large number of these appears to be nearly equal. Experience can only demonstrate which will ultimately bear off the palm in the competition. Certain it is that for the bolts of fish joints the application of methods of locking the nuts removes the only objection of note which formerly acted as a drawback to their many points of excellence and will do much toward extending and perpetuating their use.

Our engravings illustrate a new nut-lock, invented by Mr. Henry Beagle, Jr., of Philadelphia, Pa. The advantages claimed for the device are, that in its use nuts may be locked or unlocked as often as may be desired without injury to any part, and that, as it requires no modification of the bolt, or of any part through which the bolt passes, it may be applied to bolts of joints now in use by simply removing the nuts and placing the washers on the bolts as hereinafter to be described, replacing the nuts, and inserting the small rods which constitute a portion of the device.

Fig. 1

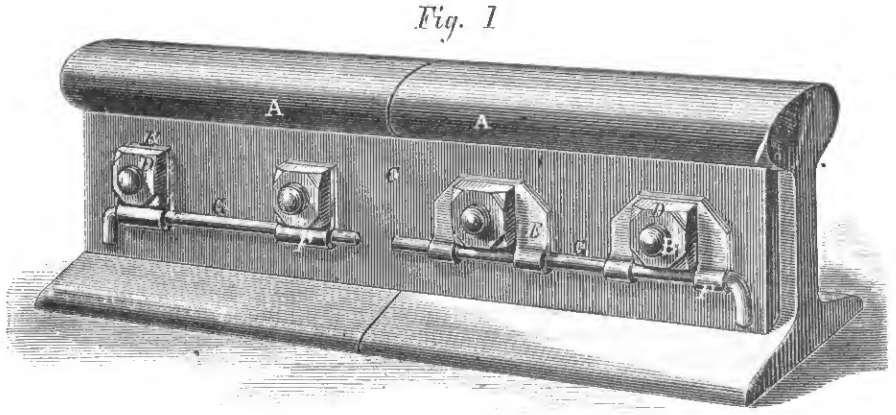


Fig. 2

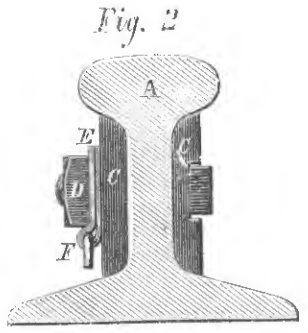


Fig. 1 shows a fish-joint, having its nuts locked by the device under consideration, Fig. 2 being a section through one of the bolt holes.

The rails to be joined are indicated by the letter A, and the fish bars by the letter B. The bolts are shown at C. The nuts, D, are screwed down upon the washers, E, which washers are made double, as shown in the section, Fig. 2, or in another way described below, and formed with a loop, F, through which small rods, G, are passed after the nuts are turned down.

The washers turn with the nuts as soon as the latter are turned down enough to engage with the loops on the former, and consequently when the nuts are turned square with each other, the washers are also turned square, so that the rods are easily inserted. After the rods are driven in, it is evident the nuts cannot turn until the rods are withdrawn.

Two forms of the washers are shown in Fig. 1. Those to the left are formed in the manner shown in section, Fig. 2, those to the right are formed of only one thickness of metal, the eyes being formed by bending projecting portions of the metal back upon itself.

In some cases it may be advisable to make the rods, G, U-shaped, and adjust the washers so that their eyes may be toward each other, so that one arm of the U-shaped rod may pass through the eye of one washer, and the other arm through the eye of the other washer, the rods thus locking the nuts from turning.

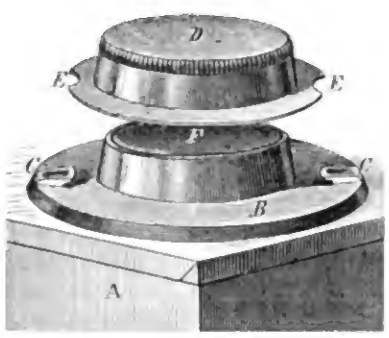
The washer and rod may be modified for locking single nuts, by inserting a pin in the object through which the bolt passes, in such a position that the edge of the washer and the rod may both abut against the pin, and the nut may be turned freely without touching the pin while the locking rod is withdrawn.

Patented, May 31, 1870, through the Scientific American Patent Agency, by Henry Beagle, Jr., 410 North Fifth St., Philadelphia, Pa., who may be addressed for the entire right, or State or railroad rights.

ALEXANDER'S SAFETY-CAP FOR MOLASSES, VARNISH, AND OIL CANS.

Our engraving illustrates a neat little device for the purposes indicated in our heading, which the inventor assures us has been tried and approved by parties who can oil. It is certainly very simple, and easily applied, while it is an effectual preventive of leakage during transportation.

A represents a portion of the upper part of the can; B is a a cap of brass, or other suitable material soldered over the hole in the can. To B are attached snugs C. A second cap, D, is formed with notches, E, in its edge so that when placed upon B, the snugs pass through the notches. The upper part of D is milled, as shown, for convenience in turning the lower edge under the snugs, C. A cork disk is fitted into the cap, D, so that when the edge of the latter is turned under the snugs, C, the cork is brought down firmly upon the upper part of the cap, B. The cap is opened so that its contents may be poured out by removing the cap, D, and cutting a disk out of the cap, B, at the part indicated by the letter, F. The cap, D, being again replaced, the can is again effectually sealed.



Patented, through the Scientific American Patent Agency, July 12, 1870. Address H. C. Alexander, care W. P. Converse & Co., 54 Pine street, New York city.

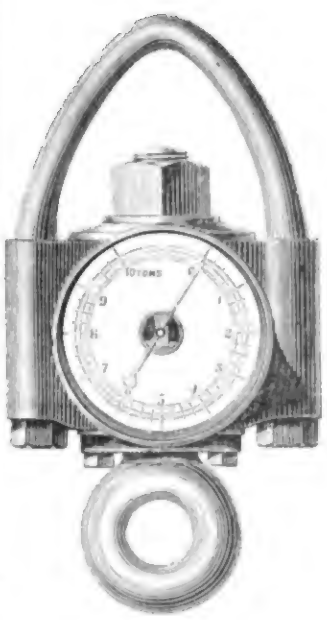
IN the States north and east of Pennsylvania, the production of anthracite iron, in 1869, was 260,256 tuns.

DUCKHAM'S HYDROSTATIC WEIGHING MACHINE.

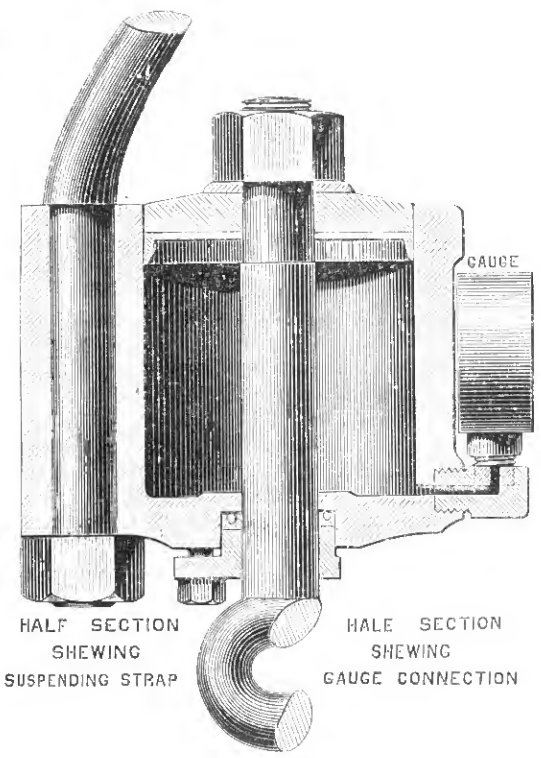
We reproduce from the *Engineer* drawings of a weighing machine, which has been invented by Mr. F. E. Duckham, of Millwall Docks, England, which seems likely to be very useful in weighing heavy bodies in process of shipment or unshipment.

Weigh-bridges, or even portable weighing machines, are incapable of the performances of the new contrivance. The principle of Mr. Duckham's machine is very simple, and consists of the filling of an open-top cylinder with water or oil by preference, and suspending the machine to a crane. A piston passes downward through the cylinder, and terminates in an eye, to which the articles to be weighed are attached.

The machine is connected with a dial gage, the indicator of which is worked by the liquid displaced from the weigher. On the load being removed the liquid is returned to the machine. A peculiar merit of this machine is its lightness, an 84-lb. weight machine being equal to weighing ten tuns. Others much lighter are capable of performing very delicate work, and others, again, can be made proportionate in weight, which can weigh up to 100 tuns.



Mr. Duckham's machine has been rather crucially, but quite successfully tested, in weighing the armor plates of the iron-clad turret ship *Abyssinia*, now in process of construction by Messrs. Dudgeon, of Millwall. The plates are weighed on delivery, no weigh-



bridge being necessary in the process. They are from 8 inches to 10 inches thick, and weigh from seven to ten tuns each, and are shipped and weighed by one process—lifted, slung, and weighed all at once.

For weighing coals the machine is very convenient, as it can be so adjusted as to allow for the weight of the skip, and also to show the exact weight of the out-pull. The leakage is obviated by cup leather packing, which becomes tighter as the pressure to which the machine is subjected becomes greater.

SPECTACLES were invented by one Alexander de Spina, a monk of Florence, in the year 1285.

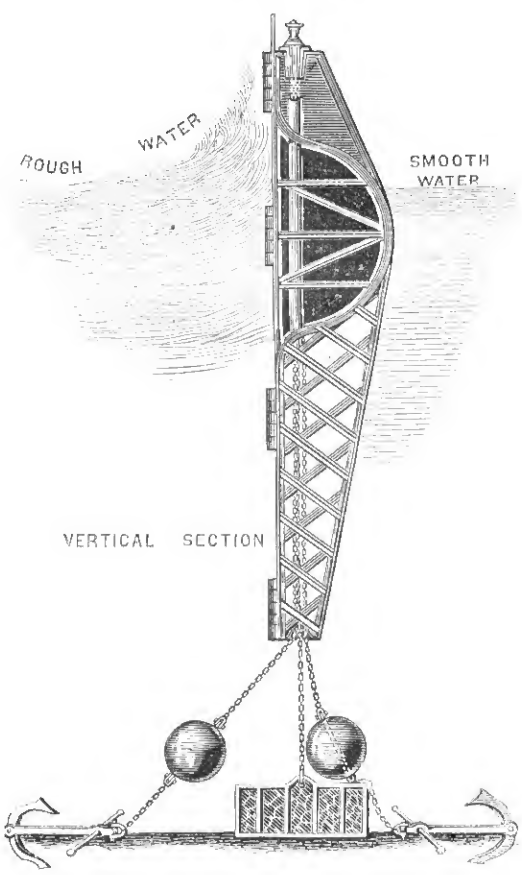
FLOATO-STATIC BREAKWATER.

This invention is based on two well-known laws connected with the motion of waves.

It is known, in the first place, that the wavy agitation of water by wind does not extend very deep beneath the surface of the water; secondly, that the motion of the water in forming waves is almost entirely a succession of undulations, and has very little forward motion until the waves reach comparatively shallow waters, when they become waves of translation and exert their greatest destructive power.

According to the *Engineer*, from which we copy the annexed engraving, the inventor proposes to construct a wall of iron or other suitable material, which is to be placed vertically in the water to seaward of the place to be protected, and to be of sufficient hight, that its lower edge will reach below the waves to comparatively calm water, while its upper edge will project above the water a sufficient distance to form the breakwater. It will be supported by a water-tight compartment, or by a series of water-tight compartments, placed near the upper edge of the vertical plate or wall, as shown in the accompanying engraving.

The whole structure will be strengthened by vertical ribbed horizontal girders, to insure stiffness and locality by T and angle irons. It will be anchored laterally by anchors, the chains of which will pass through hawse pipes in the lower edge, up through the floating drum, by means of water-tight pipes, to the upper edge, where they will be fastened, and where they may be tightened or slackened as may be necessary. The chains may also have weights attached to them to take up the slack at low water.



In seas such as the Mediterranean, where there is little or no rise and fall of tide, there may be attached in addition a vertical weight of stone or other material, which shall rest on the bottom of the sea for the purpose of holding the structure rigidly down. The floating power is by preference placed on one side of the vertical wall, so that the structure will incline toward the sea when in its normal position, and when the force of the waves drives against it a vertical plane will be presented to them, with no projections on which water may catch.

The floating power will be made so great that the horizontal force or pressure of the water at the top will not be sufficient to submerge the structure, which will be made in sections of convenient length, connected by hinges to admit of a slight lateral movement. When waves strike at the top the structure will only yield to a slight degree, owing to the great surface exposed to the still water on the opposite side, and the force of the waves will be almost completely checked.

For the coast of Chili, for instance, the inventor proposes to make a breakwater of this description in sections of 300 ft. long by 60 ft. deep, 44 ft. of which will be under water; each section will weigh about 500 tuns, and cost about £10,000, inclusive of anchors, chains, etc.

DURING 1869, the rails imported from Great Britain amounted to 336,500 tuns, an increase of 36,340 tuns, as compared with 1868.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

☞ "The American News Company," Agents.121 Nassau street.New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building 188 Fleet st. Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXIII., No. 5 . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, JULY 30, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

*Improved Engraving Machine.... 63
*Positive action Scroll Saw..... 63
Coal Mines on fire..... 63
R. Trevithick, Inventor of the Locomotive..... 64
The Gas Wells of Erie, N. Y..... 64
On Thought without Language.... 65
Pure air in Factories..... 65
An Instrument to measure the Relative Pressure and velocity of the Wind..... 65
*The Rider Horizontal Engine..... 66
Heat of the Gulf Stream..... 66
Corsets and Chignons..... 66
Scientific Intelligence..... 66
*The Hymenopters..... 67
*Improved mode of Working Artillery..... 67
Inertia..... 68
A Theory of Thunder..... 68
The Bachelder Extension—Interesting Letter from the Commissioner of Patents..... 69
Interesting Patent Decision..... 69
Wanted—Free Trade in Boiler Iron..... 69
Hartford Steam Boiler Inspection and Insurance Co..... 69
Experiments with Hydrate of Chloral..... 69
Banishing Nitro-Glycerin..... 69
How to make tin fruit cans..... 69
A New dodge in Hair Dyes..... 69
To Remove Silver Stains..... 69
*Improved Nut Lock..... 70
*Alexander's Safety-cap for Molasses, Varnish, and Oil Cans..... 70
*Duckham's Hydrostatic Weighing Machine..... 70
Floato-Static Breakwater..... 70
Bessemer Steel-American Improvements..... 71
New Mechanical movements..... 71
A New Bleaching Agent..... 71
Can Mineral matter be assimilated in the animal economy?..... 71
Progress of Invention Abroad..... 72
Liebig's Extract of Meat..... 72
Our Correspondence..... 72
Action of Sea Water on the Metallic Fastenings of Ships..... 73
Public Parks and Floral Decorations..... 73
Rogers' Patent Price Current Books..... 74
Death of Chevalier de Loosey..... 74
Experiments with Hydrate of Chloral..... 74
Applications for the Extension of Patents..... 74
Answers to Correspondents..... 74
Recent American and Foreign Patents..... 74
List of Patents..... 75

To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

BESSEMER STEEL---AMERICAN IMPROVEMENTS.

The late report of the Massachusetts Railway Commissioners, and the opinions and practice of engineers and railway managers generally, are so favorable to steel as a material for rails, structures, and machinery, that we may now look for the rapid development of the Bessemer manufacture in this country.

But in order to compete with the cheap labor of foreign countries, American manufacturers, however legislation may protect them in the starting of new enterprises, must depend, in the long run, as similar enterprises have depended before, upon the better and more economical carrying out of the manufacture, upon various labor-saving economics, and upon a greater production from a given expenditure.

We already find, and are glad to record, as a guarantee of the success of this new manufacture among us, that the old rule so often illustrated, holds good in this as in other industrial arts: While the British manufacturer is slow and wedded to precedents, right or wrong, the impatient and hard pushed Yankee strikes out boldly into new paths. The steel-making "plant," down to the smallest detail, that Bessemer planned ten years ago, is still almost religiously adhered to by all his licensees in England, while in an American works Bessemer himself would hardly recognize the machinery by which his wonderful process is carried out. The talent and enterprise of our pioneers in this new production, have not only overcome the manifold and serious difficulties of untried materials and unskilled labor, but they have been directed to a radical improvement of works and machinery.

These facts became specially apparent by an examination of the Bessemer steel works of Messrs. Griswold, at Troy, N. Y., which have been rebuilt, and are now running under the management of Mr. A. L. Holley, late Superintendent of the Harrisburg Steel Works. Official statistics show that the largest production of one pair of five-tun converters in Great Britain is 50 tuns (ten conversions) in twenty-four hours. The Troy works are regularly producing 60 tuns (twelve conversion) per twenty-four hours, and are preparing to work up a still larger product which the converters seem to be able to make without crowding.

The principal cause of this large production is an improvement developed by Mr. Holley, in renewing the tweers of the converters. It is not perhaps generally known to unprofessional readers, that the perforated fire-clay blocks, through which the air is blown into melted cast iron to convert it into steel, are so much burned away after four to six conversions, as to require renewal. The usual process of renewal is to knock out the tweers from the fire sand lining of the converter, insert new ones, pour into the converter a mixture of sand, clay, and water, to level up the lining around the tweers, and then wait for the semi-fluid mass to set; or, the whole bottom of the converter containing the old tweers is removed, and a newly prepared bottom, containing the new tweers and the lining about them, is fastened to the converter, and the space around it is similarly filled with the semi-fluid mass of refractory material. This takes time and involves great risk of the steel running through the loosely set lining thus formed. A safer method is to wait from twelve to twenty hours, till the converter is cool enough to enter, and then to make the lining good around the tweers by ramming and molding the refractory material from within. This, of course, largely diminishes the product of the works.

The improvement to which we have referred consists in a simple method of getting at and ramming the annular space between the converter lining and the new bottom, from the *outside of the converter*. The result is, that instead of depending on a loosely set and dangerous mud joint, or of taking a day to make a sound joint by getting into the converter, a perfectly sound, rammed joint is made in *four hours*—that is to say, four hours from the pouring of the last conversion on an old bottom, the new bottom is set and heated ready to receive a charge of steel.

Another improvement, from the same source, has been more recently introduced at Troy, but gives promise of a considerable economy. The lining of the converter is a mass of fire-sand, crushed quartz, and clay, wetted and rammed into the iron shell of the converter, around a circular pattern, so as to form a wall, say ten inches thick. The pattern is then withdrawn. As the material has to be rammed very solid, the process occupies some two days; and as the linings only last some 200 conversions—say a month—the time thus lost is considerable. The improvement now in use at Troy consists in ramming up four immense hollow bricks, of suitable shape, which are dried and set into the converter, and form its entire lining. These bricks, the largest of which is a hollow cylinder of 8-feet outer, and 6 feet inner diameter, and four feet high, are rammed up in wrought iron shells which fit the converter, and are secured by set screws. As there are always duplicate bricks prepared, the converter is thus out of use only while they are being set in, or about half a day.

Mr. Holley's various other improvements, which are in use in all the other works running in this country, are calculated to produce more steel from a given "plant;" and consists chiefly in the arrangements of casting pit, cranes, and machinery, by which more steel may be manipulated in the same time by a given number of men. There are also many improvements in details.

The early difficulties of the Bessemer process in this country are now so far overcome—indeed, the steel plant and machinery are so much better here than in Europe, that several new establishments are about to be built, both in the Eastern and Western States. The only remaining problem is the production of pig iron suitable for Bessemer steel, from mineral coal. Extensive and hopeful experiments are, however, in progress, the results of which we shall duly record. The English Bessemer irons are at present chiefly used in the American works.

NEW MECHANICAL MOVEMENTS.

The success we met in securing good solutions to the problems given out some time since, encourages us to repeat the experiment. It also amply demonstrates the fact that combinations for effecting peculiar movements are by no means exhausted. We think our readers will agree with us that problems of this kind are as a means of mental discipline not inferior to those of a purely mathematical character.

Without further parley we will, however, present a few more subjects upon which to exercise their inventive talent:

PROBLEM 1.

It is required to produce continuously, in one direction, four revolutions in one shaft, to every one of the shaft from which it originally derives its motion, without the intervention of belts, or any rotating device between the two shafts, such as gears, pinions, or pulleys, although the shafts may themselves have upon them pulleys or other rotary device, but they must not be placed in contact or connected by belts.

PROBLEM 2.

Required to produce continuous rotation in one shaft from the rotation of a second shaft, the shafts to revolve in opposite directions, without the use of endless belts, toothed wheels, or friction gearing, pitmans, rocking levers, cams, or fly-wheels, and the shafts to be separated to any reasonable required distance.

PROBLEM 3.

Required to drive one shaft by means of a belt and pulleys, the power to be received from another shaft lying in the same plane but not parallel to the first, the inclination of the second shaft to the first to be forty degrees if necessary, and no intermediate friction pulleys or idlers to be used, that is, the belt must run straight, without any intermediate device, from the pulley on the driving shaft to that on the driver.

PROBLEM 4.

Required by means of a *belt alone*, to not only transmit rotary motion from one pulley to another pulley, but to impart to the shaft of the driven pulley a longitudinal motion, the same as would be given to it by a screw thread cut upon it, but without the use of a screw or cam groove on the shaft, which shall be simply a plain shaft of the ordinary kind, running without shoulders in plain bearings, and the pulley to be also a plain pulley of the ordinary kind keyed to the shaft.

The solutions of these problems may be accompanied by diagrams, if they cannot well be explained without them.

A NEW BLEACHING AGENT.

Chemists have long known that permanganic acid was one of the best bleaching agents in the whole repertory of science, but the cost of the material has hitherto prevented the application on a large scale of this valuable substance. The recent attempt of Tessie du Motay to manufacture oxygen from the atmosphere, by means of soda and the black oxide of manganese, has disclosed the important fact that permanganic acid can, according to his process, be economically made in any quantity, and with great facility. It is only necessary to fuse lime, soda, or potash, and peroxide of manganese in a current of air, and the work is done. This discovery has revived the proposition made long ago to employ the permanganates as bleaching agents on a large scale. For this purpose the permanganates of soda and potash are preferred.

In the case of wool, for 100 pounds of well scoured fleece a bath is made of 4 pounds of permanganate, mixed with 1½ pounds of sulphate of magnesia in a barrel of water. The goods to be bleached are suspended in the bath, which has a beautiful purple color, until the liquid becomes colorless, and the oxide of manganese has been precipitated as a yellowish brown deposit.

The next step is to free the goods of the adhering precipitate of manganese, and to complete the bleaching. This could be done by employing oxalic acid, or oxalate of ammonia; but on a large scale it is found more economical to use aqueous sulphurous acid, into a bath of which acid the articles are plunged immediately after the action of the permanganates has ceased.

To prevent the yellowing of the yarns and tissues, the articles are well washed and placed in a fluid bath composed of 48 lbs. of water, 1½ pounds of soft soap, ¾ pounds of caustic ammonia of 0·9 specific gravity, well mixed. Cotton, flax, hemp, and paper stock, can be bleached in a perfectly analogous way by varying the proportions of the permanganates to suit the circumstances.

We have previously referred to the use of permanganate for bleaching old engravings, where it has proved the best agent of any we have at any time employed. The cheap manufacture of permanganic acid suggests its use as a disinfecting agent, also in the refinery of molasses, sorghum, beet sirup, and a host of other industries, and it has further extensive scientific value in the analysis of iron ores, in the production of pure oxygen gas, and as a re-agent in our chemical laboratories.

Although soda and potash have generally been employed in its preparation, it is a question whether lime would not be cheaper and better. The permanganate of lime is less liable to fuse, and from it, by means of sulphuric acid pure permanganic acid can be isolated for further use.

The old way of making the manganate or chameleon mineral, as described in our books, was to fuse the black oxide of manganese with an excess of caustic soda and some nitrate of soda in an open crucible. A dark green mass results, chiefly composed of manganate of soda. It is possible that this mass, mixed with a proper proportion of sulphate of soda, would answer every purpose for bleaching. This old method will probably be superseded by the modern one above described, of passing a current of air over the fused mixture of soda, potash, or lime, and the black oxide of manganese, as the same process can be used in the preparation of oxygen gas.

The method of making aqueous sulphurous acid, suggested by Professor Wieser, of Carlsruhe, is probably the best. Anhydrous sulphate of iron (ordinary copperas previously heated to 212° F.) is mixed with sulphur in a cylindrical iron vessel, and heated to redness. The sulphurous acid thus generated is conducted into a vessel filled with water, which absorbs thirty to forty times its volume of the acid. A concentrated aqueous sulphurous acid is thus formed ready for use in the bleaching operation. During the process of bleaching, the bath is warmed to 88—100° F., as, according to numerous experiments, this temperature has been found to be most effective.

Permanganic acid associated with sulphurous acid appears destined to play an important part in the arts, both as bleaching and disinfecting agents.

CAN MINERAL MATTER BE ASSIMILATED IN THE ANIMAL ECONOMY?

Some months since, a controversy arose between some of our correspondents in regard to the assimilation of mineral matters in the animal economy. The discussion was not a very satisfactory one, as it was conducted by those who evidently had not given that attention to physiological and chemical facts demanded by the nature of the subject.

In the October number of *Good Health*, a writer made the following remark:

"Phosphorus is a very essential ingredient for the nerve cells, while sulphur is a most necessary constituent of human bile. In no way can we substitute either in an artificial way We might eat all the sulphur and all the phosphoric acid we please, without adding the least particle to our blood formula."

This statement transferred the controversy from our columns to those of the periodical referred to.

It was ably replied to in the June number of *Good Health* by Professor Horsford, who plainly proved, first, that phosphorus does not, as implied in the above quotation, exist in the nerve cells and the blood in any other form than as a constituent of phosphoric acid.

Second. Professor Horsford showed that the statement that "phosphoric acid cannot be supplied to the blood by taking some form of phosphoric acid as food," is wholly erroneous. He says:

"When we prepare acid—phosphate of lime, magnesia, potassa or iron, by treatment of burned bones or mineral phosphate with sulphuric acid, and spread it as superphosphate on soils, it is taken up through the roots and deposited as phosphate in the bran and flour of the wheat, and we eat it as a constituent of the gluten. When we add the same phosphate to the flour, in making the bread, it enters the stomach just as much a phosphate as if it had come in with the bran, and it passes from the stomach to become a constituent of the

chyle and the blood, just as much in the one case as in the other."

How any one, at all acquainted with the chemistry of cereal foods, or with the physiology of assimilation, can dispute these plain *facts*—for undeniable facts they are—passes our comprehension. Nevertheless, a man who, at least, pretends to knowledge of both physiology and chemistry (with how much reason will be seen further on), has been bold enough to deny that they are facts.

But let us cull a few more facts from Professor Horsford's article before we pay our respects to his opponent. The following passage contains the gist of his argument:

"The experiments of Chossat, in 1844, demonstrated that pigeons could not be sustained on pure wheat. In time, their bones became spongy and friable, and at length the birds perished. But supplied with lime—either as phosphate or carbonate, with the wheat, their health was maintained, or entirely restored, after having been greatly impaired from eating pure wheat alone. The explanation is simple: Wheat contains a great excess of phosphate of potassa, and but little phosphate of lime. With lime introduced into the stomach in the form of carbonate, mutual decomposition yields phosphate of lime, which is essential to the formation of bones, and, to a less extent, of other tissues. To show how absurd the doctrine that mineral matter cannot add to the 'formula' of the blood is—let us consider for a moment what a thoroughly pure mineral substance water is! Will it be maintained that none of all the water we drink becomes part of the organism!

"There is another consideration that should have place in the discussion of this question: the assimilation of mineral matter is an essential condition of organized life. It is the plain law of development—of growth and repair—the law of nature.

"The observations of Pasteur showed that humbler plants and animals alike possess the power of appropriating the phosphates of purely mineral origin to build up their tissues; and nothing has yet been discovered to show that the higher forms of animal life, including man, are deficient in any of the powers of assimilation, possessed by the humbler types of animal life."

This was replied to by Dr. Carl Both, in the July number of the magazine referred to. His assumption of knowledge is quite astounding. Dr. Both appears to have grasped the secret of life. To him, all that has been mysterious to the profoundest physiologist, hitherto, has been unveiled, and he hurls this astounding discovery forth without even the minutest note of preparation. Well may the scientific world stand thunder-struck at the fact that he has found out the mystery of mysteries—what is life.

He does not deal in glittering generalities. He does not tell us, like Coleridge, that life is "unity in multeity," but, in his first sentence, he utterly overwhelms us with the following definition:

"The chemical combinations, exchanges, and reactions of the fourteen elementary minerals composing the human body in connection with warmth, light, electricity, galvanism, and magnetism, constitute what we call life."

There is nothing doubtful about this. The Doctor evidently thinks that a "wayfaring man, though a fool, may not err therein."

But will the Doctor, whose profound erudition we greatly admire, do us the favor, by the aid of this definition, to draw a boundary line between things living and things lifeless. Of course he should be able to determine the precise time when life ceases, since then—to do full logical justice to his definition—some one or more of the elements of life ought to to cease in the animal organization.

We are willing to wager the Doctor will say, "if he does us the favor to respond," that it is galvanism or magnetism, since, from some subsequent remarks, we are inclined to believe he makes the use of these agents a marked feature of his practice. Surely, it can not be chemical action, or heat, or light, which ceases at death. It must then be electricity, or galvanism, or magnetism, since, in the Doctor's philosophy these appear to be distinct forces. We are anxious to obtain more light upon this theory of life, which, however, is rather too dogmatically enunciated for a mere theory.

Dr. Both commences by a point-blank denial of facts stated by Prof. Horsford, quoting only as authority for such denial a single writer on therapeutics, whose name, we venture to say, not one medical man in a hundred, in this country, has ever heard mentioned. But what he lacks in authority he makes up in assumption, as he denies *in toto* the very general belief, among physicians, that iron is a useful remedy in cases of the impoverishment of the blood, and charges this belief upon their "credulity and imagination."

He, however, gives us his opinion of the office which iron performs in the blood, namely, that it "serves principally as a necessary body for the production of animal magnetism, and that it appears as metal, or perhaps as oxide, but, probably, in a form as yet entirely unknown."

Now we confess to never having heard of Dr. Both until his name appeared as the author of the article under consideration, but we are satisfied that he is one of the "universal remedy" school of practitioners, and we would be willing to risk something that animal magnetism is his hobby. It is these hobby-ridden and hobby-riding medical men who claim to have got deeper into science than any others, and who are always ready to frame theories which have no basis in fact.

But the Doctor at length makes an admission which seems to us a surrender of his position. The laws which control assimilation are admittedly the same for all warm-blooded animals. But Dr. Both admits that fowls take lime into their stomachs to form the shells of their eggs. Now, if fœtal growth, from the earliest period be not a process of assimilation, will Dr. Both tell us what it is? If not assimilation, it must be mechanical accumulation, and we hardly think any man can be found so bold as to claim that the shells of eggs are mere mechanical deposits of raw material.

Dr. Both does not deny that it is assimilation, but he does deny that, because the fowl can digest lime, the lion, or the cow, or the human organism can do the same. In doing this, however, he makes the statement that "lime serves a similar purpose in the body of the fowl that salt does in the human body," which is certainly an acknowledgment that the human economy can directly assimilate mineral matter contained in common salt. Thus, the whole question of the assimilation of mineral matter, and the determination of how many and what kinds of such matter can be assimilated stands just where it did before this discussion.

PROGRESS OF INVENTION ABROAD.

Our European exchanges bring us accounts of some inventions of interest, from which we collate some of those of a suggestive character, as well as some which perhaps may find a useful application in this country.

A protective coating for iron and other metals has been invented by Mr. J. Crouziers, of Ollioules, France, to which the inventor has given the name of Electro-Cathodic Insulating Mastic, which to the scientific reader will convey the fact that its application will prevent the corrosion of metal when immersed in fluids calculated to generate galvanic action. Its composition and application are as follows: Take of sulphur, (say) 38 per cent; coal tar, 20 per cent; gutta-percha, 5 per cent; minium, or red lead, 6 per cent; white lead, 7 per cent; pitch, 10 per cent; resin, 10 per cent; spirit of turpentine, 4 per cent; total, 100. Melt the sulphur in one vessel, and coal tar, gutta-percha, minium, white lead, pitch, and resin, all together, in another, but before adding the gutta percha to the coal tar, dissolve it, as far as possible, in the spirit of turpentine, and when all these ingredients have melted pour in the sulphur very gently from the separate vessel, then thoroughly mix the whole, and apply the composition hot by the aid of a brush, by dipping the article to be coated into it, or in any convenient manner.

Mr. Crockford, of Dublin, Ireland, has invented several new processes for utilization of waste products. One of these is a method of treating what is known as flux skimmings, produced in the process of galvanizing or coating iron with zinc. For this purpose he adds a sufficient quantity of hydrochloric or sulphuric acid to the flux skimmings to dissolve all the zinc, and then precipitates all the zinc with the ammoniacal gas arising from the distillation of gas liquor, by which means he obtains oxide and sulphide of zinc and hydrochlorate or sulphate of ammonia. Sometimes he passes through the solution, toward the end of the operation, a stream of sulphureted hydrogen for the purpose of rendering the precipitation quite complete.

A second process by the same inventor consists in the treatment of the liquor from paper mills resulting from boiling esparto grass, wood, or other materials in caustic soda. He first evaporates the liquor to dryness, and then submits the dry product to distillation at a red heat, whereby the volatile and other matters are collected, and he afterwards extracts the carbonate of soda left in the furnace or retort in which the distillation has been effected by lixiviation, at the same time extracting a quantity of black, similar to "lamp black."

The same inventor has devised a method of condensing and collecting the fumes and gases from the flues of furnaces in which lead and other ores are smelted. To do this he draws off the mixed fumes and gases from the flues of furnaces wherein lead or other metal is smelted, and forces them, by means of a fan or other similar means, into and through a quantity of filtering material, such as canvas, cotton, or fine coke, which material may be renewed from time to time when it becomes clogged; before passing the fumes and gases through the said material they are cooled by passing them through showers of water or otherwise; thus materials which would otherwise be destroyed by the heat are utilized.

An Hungarian gentleman has, we are told, constructed a railway five miles in length on a mountain in the heart of Hungary. A remarkable peculiarity is the total absence of all permanent way. Square beams of oak 8 in. high and 14 in. broad are laid on the ground, and only at rare intervals, where the great unevenness of the ground absolutely requires it, cross sleepers are laid under them. Each of these longitudinal beams has a length of 18 ft., and on the two edges of the beams are the rails, which are only 2 in. broad, and so thin that they weigh about 1 lb. per foot. These beams and rails may be taken up at any moment, and the railway thus relaid whenever it is required. The trucks run on two pairs of wheels 8 in. in diameter; the bodies of the trucks are about three times the width of the rails, and are placed so low on the wheels that they have just room to pass over them. The arrangement of the weight and the system of breaks are said to be so perfect that the train may be stopped when on a gradient of one in seven, and going at the rate of twenty or thirty miles an hour, within six to eight yards. The five miles cost $10,000, and after the experience now gained the work may be done for about $1,000 per mile.

The substitution of heavy paraffine oils for high-pressure steam used to obtain high temperatures for the evaporation of liquids has been made in an establishment at Lambeth, England. These oils may be heated safely to a temperature of from 600° to 700° Fah., and they circulate in heating exactly like water. In the establishment alluded to the apparatus used is as follows: A close system being made, the oil heated in a coil of pipe placed in a furnace rises first to an air-tight tank, from which it runs through pipes and the jackets of pans, descending as it cools to the coil of pipe in the furnace. It is claimed that the method besides being safer is more economical than steam. A pyrometer is contrived to show the exact temperature of the oil as it leaves the tank, and means are provided for regulating and keeping the temperature uniform. This method appears to us to possess great promise, and if it prove entirely successful, is capable of extension to many important branches of industry.

M. Ducomet, of Paris, has invented a simple and ingenious method of cutting glass tubes. It consists in the employment of a metallic rod with a diamond set in one end, the rod being covered with plaited cotton and supplied with a movable gage to regulate the length. To use this instrument all that is necessary is to introduce the end carrying the diamond into the tube to be cut, and then turn it round so as to make a scratch with the diamond around the interior of the tube at the point where it is desired to separate the latter. The correct position of the cut can be insured by the use of the guard, which can be fixed at any desired point on the rod by a screw. After the cut or scratch has been made in the manner described, the tube can be at once divided at the desired point by merely bending it, or, if the piece to be cut off is very short, all that is necessary is to hold the tube above the flame of a lamp or candle, when it will at once divide at the point where the diamond cut was made. M. Ducomet states that it is absolutely necessary that the rod should be covered with cotton or similar soft material, or that otherwise tubes cut in this way—gage-tubes for instance—will subsequently break when in use. The instrument is particularly adapted to cutting gage-tubes.

LIEBIG'S EXTRACT OF MEAT.

If the value of Liebig's extract of meat were fully understood no household would be without it, and no one bound on a hunting, fishing, yachting, or pedestrian tour would omit to include it as an indispensable part of his stores. It has been recently subjected to trial by an English traveler, Mr. W. T. Suffolk, and we find a note of the results in the *Chemical News*.

Mr. Suffolk says: "The action of the extract is very marked when used as a remedy for the exhaustion so frequently attending long and fatiguing walks, closely resembling in its effect the well-known restorative, tea and brandy, but it is much more permanent, acting not only as a stimulant, but also as nutritive matter.

"The extract cannot well be used by itself as a substitute for ordinary food, but when accompanied by a quantity of less nutritious and digestible matter greatly augments its dietetic value. With Liebig's extract, bread or biscuit, and, if possible, hard-boiled eggs, the pedestrian will be provided for nearly every emergency. For the sake of variety of flavor, pepper, salt, curry powder, or other condiments may be used.

"I prefer, when possible, to use the extract in the usual way—dissolved in hot water as soup—but where hot water cannot be procured it may be thinly spread upon bread or biscuit and eaten with equal effect. In either way it gives strength almost immediately, and stands very much in the same relation to ordinary food that petroleum does to coal as a steam-producing fuel, enabling power to be speedily obtained.

"It must, however, be borne in mind that stimulating food can only be employed as an auxiliary, and not a substitute for proper rest, the only true restorative. In long pedestrian journeys everything depends upon intervals of rest and proper food, if the exertion is to be continued for many days in succession.

"Spirit of any kind should always be used cautiously; as its stimulating power is at the best of short duration, nothing is added to actual bodily strength. It is sometimes of value in cases of difficult breathing, caused by steep ascents, a teaspoonful of strong brandy or whiskey generally giving instant relief; also in the nervous giddiness which occasionally affects travelers, especially solitary ones, when walking on narrow elevated paths. This may seem somewhat like acquiring 'Dutch courage,' but nevertheless the discreet use of spirit in such cases is not to be undervalued."

It appears to be certain that we obtain strength by burning up the blood within us, and to replace this waste food is required. We obtain temporary relief by the use of stimulants, but this is very much like using the furnace as fuel, for our relief is at the cost of the tissues of the body. The extract of meat, on the contrary, stimulates and supplies nourishment to the blood.

According to recent researches the extract contains constituents analogous to some of the alkaloids, quinine, morphine, theine, and it is therefore similar to tea or coffee in awakening and sustaining both the appetite and digestive powers, without possessing any of the after-effects that follow these stimulants. The extract has the further advantage over tea and coffee in the mineral matters which it contains, such as phosphorus, lime, potash, and sulphur.

As the extract is a waste product in South America and Australia there is no reason why it should not be furnished to us in unlimited quantities and at reasonable rates.

OUR CORRESPONDENCE.

One of the most interesting and useful features of the SCIENTIFIC AMERICAN has been and is its correspondence. Our columns have always been open to receive information from those who have anything important to communicate,

and to impart such facts and suggestions as we may, in answer to the queries of our correspondents.

Invariably, at this season of the year, however, our correspondence flags. Neither mind nor body works with such vigor and freedom during the heat of midsummer, as in the more temperate portions of the year. Still we receive for each issue something of interest from the pens of various volunteer contributors, and would like to receive more.

Facts are above all else of value, but useful suggestions rank next to them in worth, as they serve to elicit facts and turn thought into new channels.

We wish it distinctly understood that every communication sent to this office receives careful attention. If not used or likely to be used, it is nevertheless read, and its contents well considered. Of course all who write expect us to be the judges whether what they write is meritorious or otherwise, and also whether, if found meritorious, it is adapted to our columns. The want of adaptability causes the rejection of more correspondence than any other cause. This may arise from our having already discussed a subject as much as in our judgment its interest will warrant, or that the nature of a communication may be foreign to the scope of our paper.

Facts connected with processes or materials employed in the useful arts, no matter how rudely clothed in language, are always welcome. We correct or re-write them if needful, and so do not reject any useful information on account of the style in which it is communicated.

Theories, unless in our opinion they aid in the explanation of facts, or guide research in the discovery of new truths, are apt to be rejected. We have little space to spare for speculative theories, and, unless upon careful consideration such speculations appear likely to suggest new and valuable trains of thought, we do not admit them.

A word now to those who make inquiries to be answered in the column devoted to that purpose. Our correspondents are, doubtless, little aware of the labor and pains willingly taken by us to give accurate answers to their queries. We trust, however, that they will take in good part a few hints upon this subject. The most common fault in these inquiries is that they are not sufficiently explicit. Correspondents should carefully consider their questions and be sure that they are so put that their meaning is unmistakable. To answer definitely a query whose meaning is either ambiguous or obscure, is a very hard task—one which, though always cheerfully attempted by us, might be easily lightened by a little more care on the part of inquirers.

We trust these remarks will encourage rather than deter any who wish to obtain or impart information through our columns, and we here re-assert our intention to fully maintain this feature of our paper, as we consider it of great practical value.

HOW INVENTORS ARE APPRECIATED IN CONGRESS.

In our last number we gave the result of the vote in Congress on the memorial of the surviving children of Jethro Wood, inventor of the cast iron plow. We have now before us the speech made in behalf of the claim by Hon. Leonard Meyers, of Philadelphia. When we find such sentiments of eulogy upon inventors, uttered in the halls of Congress, we are glad to transfer them to the columns of the SCIENTIFIC AMERICAN. Mr. Meyers said:

"I desire now to place on record my views favoring the measure which has just passed the House by the decided vote of two thirds.

"Mr. Wood was a citizen of New York, but his fame belongs to the American people. Eli Whitney's cotton gin did not bring such practical benefits to the whole country as did Jethro Wood's modern plow. The useful results of his genius may properly be placed in the scale with those produced by Robert Fulton. Like Fulton and like Whitney, Jethro Wood died unrewarded. He spent a handsome fortune in introducing his invention, which every agriculturist now finds indispensable, and he has left a large family unprovided for. We propose to do what Congress did in 1846 for the heirs of Fulton—to pass a bill for the partial relief of his family, while we recognize, as representatives, that the people are grateful for benefits conferred.

"But there is another reason why a bill of this kind is peculiarly appropriate. The Constitution contemplates a reward to inventors by grants of the exclusive right to their inventions; yet the acts passed by Congress were, at first, so defective that, when publicity was almost requisite in order to introduce an invention like Wood's, he lost by that publicity the very advantages which the constitution intended to give him. It was not until 1839 that Congress gave an inventor two years before application for a patent to test his invention without forfeiting his right thereto; and not until 1842 did the law give the right to patent the principal feature of an invention like that of Wood, namely, the shape or configuration of the mold-board. The people felt that injustice had been done to Jethro Wood in these respects. In the Senate of three Congresses bills passed for the relief of his children. One of these gave a royalty of twenty-five cents for each plow made under his patent. Small as this cost would have been to the farmers, it would have paid the heirs handsomely, for we have two million cultivators of the soil—there are five hundred plow manufacturers in the country, and they make over two hundred thousand plows annually, which would have given $50,000 a year to this deserving family.

"When we remember that this invention reduced the cost from thirty or twenty-five dollars to ten dollars a plow, when we think of the expense necessary, and the great loss of time for repairs to the old wooden or 'Bull' plow, or the Rotherham plow formerly used, with its badly-formed mold-board and its undetachable wrought-iron share, compared to the cast-iron, adjustable, and well-shaped parts of that of Jethro Wood, it might seem that every farmer in the land would have been glad to pay for its important results the sum of twenty-five cents per plow. But while approving of an appropriation of money, they insisted that the patent had expired, and the House of Representatives several times refused to pass the Senate bills for its extension. The feeling, however, that justice, in some way, should be done these heirs has, on many occasions, found expression in the public prints, through legislative and other bodies, and particularly among the agriculturists of the country.

"Mr. Brainerd, Examiner of Agricultural Implements, in the Patent Office, in a letter dated April 13, 1870, writes:

"'Jethro Wood's plow I believe to be the first in which the parts most liable to wear could be replaced in the field, with no other expense than the price of the casting. In this particular alone the invention is priceless. His form of mold-board is another feature of great importance, a feature that has, in one form or another, been incorporated into numbers of the more modern improvements in plows. In short, I can say that there is scarcely a plow now manufactured that does not embrace in its structure the leading features brought to the notice of the public by the patient and persistent efforts and skill of Jethro Wood.'

"I should tire by attempting to quote the many requests that have been submitted to the Committee on Patents that justice should be done the family of this meritorious inventor, and will conclude these references with what Hon. William H. Seward expresses in a letter on the subject:

"'I am fully satisfied that no citizen of the United States has conferred greater economical benefits on his country than Jethro Wood; none of her benefactors has been more inadequately rewarded; none has left a purer, or better, or more helpless family to appeal to her justice and gratitude.'

"I am happy to say they have not appealed in vain. Other countries have frequently rewarded those whose genius added to the fame and wealth of the people. The occasions for our doing such justice, by special enactment, are, and must ever be, rare; for, under our liberal laws, the utmost protection is now afforded.

"The nation rejoices, that, thus aided, men like Morse, Hoe, Goodyear, Howe, and hosts of others, pioneers in science and art, have won substantial rewards as well as honor. Contemplating with regret that the defects of our earlier patent system prevented a few illustrious men from reaping like results, we respond to the wishes of the people that their gratitude may be evinced to Jethro Wood by the bill we have passed to relieve his deserving family."

ACTION OF SEA WATER ON THE METALLIC FASTENINGS OF SHIPS.

We extract from the proceedings of the Institution of Naval Architects, London, the following short but comprehensive paper read by William Poole King at a recent meeting. Of course the facts stated apply equally to all similar fastenings employed in stationary floating structures and docks:

"The small fastenings of ships are trenails, iron bolts, and copper metal bolts. Each have their advantages and defects.

"The trenail, generally an oak bar of 1¼ in. to 1½ in. in diameter, is a cheap fastening. It carries no galvanic influence from the outside copper on the bottom of a ship to create rust in the ironwork within, and is vulgarly considered the very stamina and constitution of a ship; still it must strike every one not blinded by routine that nothing can be more absurd than to prepare oak timbers square, and cut out all the sap from them, at the cost of about a crown per foot cubic, and then drill this expensive timber full of holes from 1¼ in. to 1½ in. wide, in order to drive in trenails, and thus take at least half the strength out of the timber.

"About seaports, where old ships are broken up, many old timbers are met with in the fields spotted with two large holes in about every foot of their length; decay will be observed in all these holes, caused by the woody fiber being bruised by trenail driving, for bruised fiber gives nourishment to dry-rot fungus. Trenails having been squeezed in driving become rotten and weak, cease to hold the planks to the timbers with firmness, get bent, and allow a ship to bend and yield throughout its whole frame; this is called hogging and sagging.

"Iron bolts and spikes are the cheapest strength that can be put into a ship. They are the handiest fastenings that a workman can use; and a little rusting allows a very small fastening to take a very strong hold; in fact it is everything that could be wished did it but last without decay.

"In a ship iron bolts are always damp and always rust; rust frets away woody fiber. Iron bolts, too, always contain a portion of sulphur, which gets converted into sulphuric acid, which decomposes both the salts always found in oak, and also salt water, never absent at sea. A ring of decomposed wood surrounds every bolt; and as the salts and oxide of iron are not prejudicial to fungus growth dry-rot fungus takes possession of the ring of decomposed wood.

"Iron bolts are inadmissible in the bottoms of ships sheathed with copper; the salt water acting on so large an extent of copper sends such quantities of electricity through the iron bolt that the substance of the bolt is carried away, and a vacancy, which lets in leaking water, is left in its place.

"Copper bolts and cupreous metal bolts are more expensive and less strong than iron, but unlike iron bolts, instead of fretting the wood in which they are inserted, actually preserve it, for the verdigris which is formed on the copper bolt poisons the dry-rot fungus. But the copper bolt has the serious disadvantage of having little hold on the wood through which it passes, and this little holdfast becomes less after the wood has shrunk with age, so that the only value of the fastening power of copper metal bolts is left in the riveted ends of the bolt, and when this end breaks off, as it frequently does in nine or ten years, by getting crystallized, the fastening is of no value at all.

"Trenails are too cheap and useful, as plugs for keeping out leaking water, to be given up in wooden ship construction; but the disadvantage of their unwieldy size, boring through and destroying everything, should be reduced as much as possible. Trenails should be always of the best materials, creosoted to prevent the introduction of dry rot, kept small in size to prevent their doing immoderate harm to the worthier parts of the ship, and driven short to obviate the destruction of timbers and floors.

"It is agreed on all sides that iron bolts must never be used in the wake of copper sheathing. Indeed, to insure the durability of the structure of a ship iron bolts should never be driven at all, except in situations where they can be removed and replaced.

"Covering iron bolts with zinc (called galvanizing) does not protect the iron from rusting, as the acid of the oak surrounding the bolt soon dissolves off the zinc cover, and corrosion proceeds with all its concomitant evils.

"A large quantity of copper metal fastening is now required in first-class ships. It is expensive. Let us inquire how the greatest strength, at the lowest cost, can be got from it.

"The screw form, I believe, will be found the strongest and cheapest method for the use of copper metal. This form gives a secure hold, and does not injure the wood if the pitch of the screw be kept high, that is, the threads of the screw be kept far apart. I have been accustomed to use screws 7 in. long instead of trenails.

"The bolt is molded in threads three turns in an inch, cut in a ¾ in. bolt of Prince's metal, weighing 13½ oz., and costing 9d. This screwed through a 3 in. plank penetrates the timbers 4 in. and requires no rivet, as I have tried to start a deal end from a 4 in. thick piece of oak secured in this manner, with a strain of 36 cwt. suspended, without having been able to produce the least separation of the deal from the oak. The necessity of a through fastening does not exist, as the timber can be secured to the ceiling by a similar screw to keep it exactly in place; thus a long length of metal bolt is saved, the timber but slightly wounded, and the strength of the frame immeasurably increased.

"For larger fastenings, such as those for securing timbers and floors to iron riders, I have used a thread ⅛ in. in hight, placed round outside a ⅞ in. Prince's metal bolt, instead of cutting into the body of the bolt, in order to preserve its lateral strength and rigidity. The turns of the screw are three in 2 in.; a length of 14 in. weighs 3 lb., and cost 2s. 6d. I found a strain of 49 cwt. was barely sufficient to tear this screw through a 3 in. deck deal end, and of course a longer length screwed into oak would require a heavier strain for its removal.

"Pure copper cannot be cast into a screw form any strength, and therefore I have used Prince's metal (a mixture of 16 oz. copper, 3 oz. zinc, and ½ oz. tin). This mixture runs into every sinuosity of the casting mold, is so tough that it will bend more than double cold, and I believe will not crystallize and break when it has grown old."

PUBLIC PARKS AND FLORAL DECORATIONS.

The *Albion* discourses very pleasantly of the beneficial effects of peoples' parks in the seething centers of population:

Such gardens of recreation and health have been aptly called "the lungs of great cities," and New York and Boston have, to some extent, been mindful of a public duty, in the provision of breezy places of retreat from the hot and crowded thoroughfares. It is not enough to have a Central Park, or Common, as a resort for the tired artisan and his family, for these are at some distance from the localities inhabited by the population which most needs the opportunity of breathing the fresh air, and recuperating both body and mind by intercourse with nature. The chances of social improvement by the introduction of foliage, flowers, and shrubs into the closely-packed quarters of densely populated cities, have been almost universally overlooked in this generation, more especially devoted to utilitarianism. This is the more unpardonable, because the return in pocket, as well as moral benefit to the people, has been abundantly proved before the eyes of every one.

Whatever may be Napoleon's faults, he has ever kept in the foreground the material comforts of the working man, and by far the larger portion of the extravagant outlay in the improvement of Paris has been devoted to these purposes, the results of which have not only been astonishing, but very suggestive as an example to all other cities, small as well as great.

Regarding the subject from this standpoint, a correspondent of the London *Times* lately referred to "Robinson's Gleanings from French Gardens, Parks, and Promenades," for the scientific and cheap ornamentation of open spaces in cities and towns. The beautiful and healthful fringing of the streets with foliage, is not unusual in the cities of the United States, notably so in New York and Savannah, the latter being quoted on both sides of the Atlantic, as one of the best laid out cities in the world. It is singular that in the spread of sanitary, artistic, and economic science so specially affected by Americans, this branch of the popular service has been in a great measure overlooked in the hurry of building, for the purpose of both rapidly and effectively filling the purses of speculators, although in the long run the increased accommodation of the site and its surroundings, would amply repay the extra outlay required for street gardening and ornamentation.

But in Paris this is cared for by the authorities, and well cared for. There, public horticulture follows closely on the

street builder with trees and flowers. It turns the squares into gardens unsurpassed for good taste and beauty, drops graceful fountains here and there, and surrounds them with beds of shrubs and flowers, presenting to the wearied eye of the hard worked laboring man, every charm of fresh vegetation, bringing him pure air, and aiming directly and effectively at the recreation and benefit of the people. It is true that, independently of the Central Park, something of this kind has been attempted in Union, Madison, and other squares, in this city, but these are all in rich and business quarters, while neglect and utter desolation have been the fate of Tompkins Square and such unfashionable neighborhoods. Still more flagrantly is this the case at the Battery, a site to rival which one must go to Naples, or to Palermo, and then not find the varied charm of sea and land view, river, meadows, islands, the distant mountains, the nearer Highlands, the Narrows, the lighthouses, besides the endless rush of the commerce of the whole world into the bosom of the unrivaled bay and harbor of New York. A few hundred dollars' expenditure would turn this desolate and deserted mud heap and dust reservoir into one of the most charming promenades on the continent of America. With foliage and fountains it might be made to surpass the boasted Alamedas of Spain and Mexico. The population of the crowded neighborhood and the whole city would enjoy it with a zest at least equal to the listless *abandon* of the strollers of Cadiz or Havana. However, here as elsewhere, "what is everybody's business is nobody's business," and for the want of some Peabody the crying disgrace goes on year after year without redress. Perhaps when the new Barge House, with its granite-faced promenade, takes the place of the foul weeds and mud blistered boulders at the one end, the Castle Garden Commissioners at the other will reflect a little on the name, and how sadly its present condition falls off from our conception of a garden. It is not the business of the journalist, however, to point out the particular body whose duty it is to put this or any other manifest public boon into operation. Suffice it to call the attention of the residents of New York to its shortcomings, and the ease and desirability of an alteration. A cheaper and more remunerative method of attracting popular attention was never offered to a public man—besides the additional incentive which still weighs with some minds—the certainty of greatly benefiting one's fellows both now and for all time to come—than by moving in this matter.

ROGERS' PATENT PRICE CURRENT BOOKS.

This ingenious application of the well-known method of producing a number of copies of writing or drawing at once, by means of placing prepared carbonized paper between the sheets upon which the copies are to be made, and marking with a stylus, is, we understand, meeting with much success. By it, from ten to twenty copies of a price current can be made at one marking, the names of the articles being first printed upon the leaves of the book. This must prove a great convenience to merchants who are in the babit of sending regularly price lists to their customers.

The inventor, Mr. H. D. Rogers, of 98 West Second street, Cincinnati, Ohio, is desirous to sell the right for the State of New York.

Death of Chevalier De Loosey.

We are pained to record the death of Chevalier Chas. F. De Loosey, for many years the Austrian Consul in this city. He was stricken down in the street with apoplexy, superinduced by the recent severe heat, on Thursday evening, July 21st, while returning to his hotel after making some visits in West Thirteenth street. Mr. Loosey was a liberal patron of American inventions, some of which he introduced into his native land. He obtained a number of patents here for his countrymen, and took a keen interest in all new improvements, from whatever source they emanated. He was in the habit of visiting our office frequently, and was ever eager to be informed concerning the latest and best inventions. Mr. Loosey was liberal in his dealings, pleasing in manner, and wore a genial face which his friends will never forget.

EXPERIMENTS WITH HYDRATE OF CHLORAL.—The reader will find on another page an account of some experiments with hydrate of chloral, made upon himself by Dr. F. A. Howig, of Jackson, Mich. The doctor writes us that he is forty years old, in tolerably good health, and of a decided nervous temperament. The first four experiments were made with chloral bearing the name of Powers and Wightman, the last manufactured by E. Schering. The reader curious to learn more of the effects of this new remedy, will find the experiments described of interest.

IN view of the successful result of the Suez Canal undertaking, two new lines of twenty-three steamers are spoken of intended to run between England and China *via* the Canal. It is expected other companies, with similar intentions, will be shortly organized.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

HOSE COUPLING.—Lewis M. Ferry, Chicopee, Mass., has applied for an extension of the above patent. Day of hearing Sept. 21, 1870.

MAKING AX POLLS.—David P. Estep, Pittsburgh, Pa., has petitioned for an extension of the above patent. Day of hearing Sept 28, 1870.

PLOWS.—Samuel A. Knox, Worcester, Mass., has petitioned for an extension of the above patent. Day of hearing Sept. 28, 1870.

MACHINE FOR CLEANING EMERY WHEELS.—Stephen A. Whipple, Shaftsbury, Vt., and Heman Whipple, Baldwinsville, N. Y., have petitioned for an extension of the above patent. Day of hearing Sept. 28, 1870.

SHIP'S CAPSTAN.—Charles Perley, New York city, has applied for an extension of the above patent. Day of hearing Oct. 5, 1870.

SMUT MACHINE.—Harvy B. Ingham, Camptown, Pa., has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

CLOTHES DRYER.—Samuel Morrill, Andover, N. H., has petitioned for the [illegible] of the above patent. Day of hearing Oct. 26, 1870.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

Stationary Engine and Boiler, 2d-hand, in first-rate order, cylinder 16x24. For sale cheap. Address Howard Iron Works, Buffalo, N.Y.

Rawhide Carriage Washers are cheaper than leather, and run with less noise than any other. Darrow Manufacturing Co., Bristol, Conn.

For Sale.—Entire Right of best Jeweling Lathe ever invented. Sets a jewel in two minutes. Address H. H. Heskett, Le Roy, Ill.

Wanted.—A competent Superintendent in a business in the West, requiring a knowledge of the manufacture of white metal goods and electro-plating. Address P. O. Box 5,302 New York City.

Wanted.—Circulars and price list of steam meat-chopping and sausage stuffing machine. Address A, Lock Box 1,301, Mobile, Ala.

Wanted.—A 2d-hand fire dryer for paper mill, or 2d-hand steam dryer and boiler. A customer may be found by addressing Box 2,851, New York P. O.

Artificial Skin, absolutely water-proof. Applied immediately. Bruises, cuts, & burns. 50c. by mail. Try it. Ward & Co., Skaneateles, N. Y.

Wanted—To furnish dealers with baled corn husks by cargo or car. M. H., Owing's Mills, Md.

For Sale—A good set of Bolt Machinery—Bolt cutters, swedges, nut tapper, etc., etc. For particulars apply to Laverty, Heughes & Co., Rochester, N. Y.

Japanese Paper Ware—Spitoons, wash basins, pails, milk pans, etc. Perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

Scroll Saw.—First Prize Fair American Institute, N. Y., and Richmond, Va., State Fair. For price, etc., address T.L. Cornell, Derby, Conn.

Pictures for the World.—Prang's latest publications: "Wild Flowers," "Water Lilies," "Chas. Dickens," for sale everywhere.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

The best boiler-tube cleaner is Morse's. See cut inside page.

"Your $50 Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

Wanted.—Situation as Superintendent or foreman in Machine Works. Fifteen years' experience. Address P.O. Box 1016, Worcester, Mass.

Foundery and Machine Shop for sale, with fine lot of patterns. Is doing a good business; excellent location for general jobbing, and for m'f'g agricultural implements. Address S. Moore & Bro., St. Peter, Minn.

Patent Water-proof Building Paper for Carpet for halls and stairways, shoe stiffening, walls, ceilings, and roofs, manufactured by Mc Neil, Irving & Rich, Patentees, Elwood, Atlantic Co., N.J., or 59 Duane st., New York, 520 Commerce st., Philadelphia, Pa.

The best hand shears and punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, Sci. Am., 37 Park Row, New York.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

$15 for the best Saw Gummer out. Address The Tanite Co., Stroudsburg, Pa.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Temped Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-tun propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

The Lubricating Cups manufactured by H. Moore, 41 Center st., called "Broughton's" Oil Cups are the best.

Self-closing Faucets.—"Broughton's" Patent, manufactured by H. Moore, 41 Center st., are the best. Send for circulars.

Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of the application. Send sketch and description by mail, inclosing fee of $5. Address MUNN & CO., 37 Park Row, New York

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12. Address MUNN & CO., 37 Park Row, New York.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

All reference to back numbers should be by volume and page.

— S., of D. C.—The use of silicate of potash or soda as a protective coating for iron may have been successful somewhere, but, if so, we have not seen it. The difficulties you mention, namely, the crawling, as though the surface were greased, while applying it, the cracking after application, and the rusting in fine points, have been, so far as we have been able to observe, common when these substances are used on iron, either separately or mixed. We think there is little choice between them for this purpose, and do not think their use in this way desirable.

P. K., of Kansas.—We do not think there is any work containing full information up to the latest date upon the subject of the manufacture of grape sugar from starch. You will be obliged to search for it through standard works upon chemistry and the industrial arts, in the transactions of various chemical and scientific societies, and in files of journals devoted to chemistry, pharmacy, and industrial information in general. In Dr. Ures' "Dictionary of Arts and Manufactures," Miller's "Organic Chemistry," and "Muspratt's Chemistry," you will find much information upon this subject.

W. W. A., of ——.—It is a common error among men who know little or nothing of theoretical mechanics to suppose that a fly wheel adds to the *power* of an engine. Some, in using the word power, mean by it usefulness, or efficiency to perform the ordinary work in a uniform manner. Others mean by the word probably something near what is really meant by it in mechanics. The usefulness of the engine is increased by the fly wheel, but the motive power developed in the cylinder is in no way altered thereby. Of course the same reasoning applies to the "large and small grindstone question."

N. Z., of D. C., asks: In what solution or mixture does a chemist obtain the best conception of an atom? We answer that many philosophic minds of a high order believe the atom of Dalton, a perfectly inconceivable thing, as much so as a "differential" in mathematics. We agree with this view, and therefore must answer to the above query that in no solution does the chemist get any conception of such atoms.

G. B., of N. Y.—A boiler rated at fifteen-horse power, if properly constructed, ought to produce economically steam for a fifteen-horse power engine. What advantage there would be in purchasing a larger boiler to do the same work we fail to discover, so long as there is no demand for steam except to supply the engine. Boilers are generally rated below their actual power; hence a boiler rated at fifteen-horse will yield a surplus of power.

E. H. H., of Md., is making wagon hubs of "black gum," and finds great difficulty in preventing their cracking. He now, having tried various methods for five years, appeals to our correspondents for the benefit of their experience. Can any one give a method that will prove reliable?

C. A. M., of La.—We do not believe soluble glass to be well adapted to the protection of frame buildings, as an outside application. Nevertheless, if you wish to try it, you need simply to cleanse the surface from dirt, and apply a solution of the glass, made with hot water, with a brush, as you would paint or varnish.

D. H. S., of Conn.—The flaking off of your paint is undoubtedly due to the use of glue in the first coat you used to fill up the interstices of your brick wall, made of glue, whiting, and lead. Glue size will not stand as a vehicle for the priming of outside work, and even on inside work it is apt to flake off. You should use good linseed oil for the purpose.

W. C. H., of Ohio.—We are informed that Brazilian pebbles for lenses of spectacles are still used, but that owing to improvements in glass manufacture, their use is on the decline. It is said that their only point of superiority over the best glass now made is their hardness, which enables them to retain their polish longer.

A. L. W., of Va.—The volumes of the gases are inversely, as the pressures to which they are subjected; thus, if a gallon of air be forced into a vessel already containing a gallon at ordinary atmospheric pressure, it will take fifteen more pounds of pressure to the square inch to force it in.

S. S. R., of Tenn.—We do not approve of steamboat racing, and have our doubts that even horse racing is a blessing to mankind. As the well written article you send us seems to favor both these practices, we prefer not to publish it.

C. H. O. of Ga.—The pumping of water back over the dam to propel a water wheel, after once used is neither new or feasible. Better use the power which you propose for pumping, direct to your machinery.

E. H. A., of Chicago.—We do not know the address of Mr. Binko. The item referred to was sent to us by M. Piesse, a celebrated London chemist.

G. F. G., of Mich.—The wire used in telegraph magnets, is covered with silk or with gum. It is not uncovered, as you suppose.

S. D. V., of Ala.—The term "caustic" is properly applied in chemistry only to hydrated alkalies, potassa, soda, or ammonia, or to the hydrated and anhydrous alkaline earths, baryta, strontia, lime, and magnesia.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

STEAM PACKING FOR PISTON RODS, ETC.—Leopold Katzenstein, New York city.—This invention relates to a novel steam packing for piston rods, etc., and consists in the application of an elastic plate, which is, by an oblique incision cut, so that it will not only serve as a spring for pressing the several parts of the packing together, but also as a portion of the packing itself to keep the steam from passing by.

WATER WHEEL.—Charles D. Wright, Leesville, Conn.—This invention has for its object so to construct water wheels that the full power of the water may be utilized. The invention consists in making the wheel entirely open in the center, so that the water passing through it will not be obstructed by a shaft, hub, or other central structure.

METHOD OF GRAINING WOOD.—J. J. Callow, Cleveland, Ohio.—This invention consists in a new method of graining wood—namely, by first painting the colors of the wood to be imitated on the door, panel, or other article to be grained; second, immediately thereafter covering the same with a pattern plate indented all over at short intervals; third, rubbing the said plate with a rubber cloth, these several steps being taken in the order specified, and the grained surface being then finished off in the usual manner.

RAILWAY SPRING.—Joseph Mitchell, Sheffield, England.—This invention of improvements in railway and other carriage springs, has for its object to construct flat or elliptical springs in such a manner that they will be stronger and less liable to break than springs of the ordinary construction

COMBINED KEY RING AND DOOR FASTENER.—B. H. Melendy, Manchester, N. H.—This invention has for its object to improve the construction of the improved key ring and door fastener, patented by the same inventor, May 17, 1870, and numbered 103,068, so as to make it simple in construction, and more convenient and effective in use.

FOLDING CARRIAGE FOR CHILDREN.—Thomas G. Stagg, Brooklyn, N. Y.—This invention relates to a new and useful improvement in carriages for children, whereby they are made much more convenient than they have hitherto been.

HORSE HAY RAKE.—W. H. Fay, Camden, N. J.—This invention has for its object to furnish an improved horse hay rake, which shall be so constructed as to work with the same facility upon uneven as upon even ground, which will collect the hay and grain from dust or dirt, and which will not injure or tear up the roots of the grass.

COMBINED HAY RAKER AND LOADER.—Addison Buck, Hebron, Ind.—This invention has for its object to furnish an improved machine, which shall be so constructed as to rake the hay and carry it up in a bunch, and discharge it upon the wagon.

COMBINED PLUG-TOBACCO PRESERVER AND SHOW CASE.—Adolph Bernstein, St. Louis, Mo.—This invention has for its object to furnish an improved device for preserving plug tobacco (which is required by law to be retailed from the original box or package) from dust and other impurities, and which will at the same time serve as a show case for the tobacco.

CAR COUPLING.—R. N. Allen, Pittsford, Vt.—This invention has for its object to furnish an improved car coupliug, which shall be so constructed that the cars can be easily coupled, after they have been run together, without its being necessary to insert the link as they are being run together, and which will allow the link to be easily detached while the cars are standing together, thus removing the necessity of any one going between the cars while they are being run together.

APPARATUS FOR OPERATING WINDOW CURTAINS.—John Stevens and Jairus Collins, Fairview, Ohio.—This invention relates to a new and useful improvement in the method of raising and lowering window curtains.

WEATHER STRIP.—William Henry Burghardt, Curtisville, Mass.—This invention relates to a new manner of securing weather strips to doors, with an object of making them automatically adjustable, so that they will only be projected from their sockets when the doors are closed, and drawn in when the same are opened.

HARNESS RINGS.—Samuel Aldred, Avoca, Wis.—This invention has for its object to so construct the rings which are used on the several parts of a harness that the straps cannot slide and play on the same, and consequently not be as readily worn as on the ordinary rings. The invention consists in forming inner projections on the rings so that by their means the straps are held secure and prevented from being chafed by lateral play.

WATER WHEELS.—H. J. White, Chatham, Iowa.—This invention relates to new and important improvements in water wheels, whereby such wheels are made more effective than they have heretofore been, and the invention consists mainly in movable guides attached to or forming a part of the gate) for regulating the flow of water according to the rise of the gate.

FOLDING CHAIRS.—George McAleer, M.D., Boston, Mass.—This invention has for its object to furnish an improved folding chair simple in construction, strong, durable, not liable to get out of order, and which may be folded into a compact form for storage or transportation.

LEATHER SCOURING MACHINE.—D. P, Burdon, New York City.—This invention relates to a new machine for dressing and scouring hides, skins, and leather, and has for its object to facilitate the operation by providing for a perfect adjustment of all parts to hides varying in thickness and quality.

ICE CREAM REFIGERATOR.—Carl Vignal, New York City.—This invention relates to a new apparatus for making and keeping ice cream, and consists in the use of a box constructed of non-conducting material and provided with a series of vertical cylindrical openings in which the various flavors of ice cream can be prepared and kept for use.

MACHINE FOR MAKING PRINTERS' LEADS.—Karl M. Klees, New York City.—The object of this invention is to construct a machine by means of which printers' leads of the requisite width, length, and thickness can be produced in a continuous process. The invention consists chiefly in the general arrangement and use of a pair of grooved and ribbed rollers, between which one or more continuous strings of heated metal are pressed and rolled into the requisite form.

DEVICE FOR PREVENTING LOCOMOTIVE WHEELS FROM SLIPPING ON RAILWAYS.—John R. Richardson, Max Meadows, Va.—This invention consists in arming the driving wheels of locomotives with an outside row of spurs projecting beyond the periphery of each wheel, and in laying down outside the main track rails, auxiliary rails tootned on their upper sides, with which teeth the spurs of the driving wheels engage, rendering it impossible for the wheels to slip on the track; the said spurs being provided with spring arms, which press them against pins with force sufficient to keep the spurs up to their work, and not too great to prevent them from slightly yielding against a shock.

VAPOR BURNER.—Thomas Moore, Bloomington, Ill.—This invention consists of a wick tube perforated at its upper end, and containing a piece of pumice stone or other porous iron-combustible material above the wick, the function of which is to absorb the oil from the wick and give forth the same in the form of vapor when subjected to heat. Inclosing the wick tube is a sliding cap also perforated at its upper end and subserving the double purpose of a seat for the flame and an extinguisher to it.

MARBELIZING WOOD.—Francis G. Pokorny, New York city.—This invention consists in a composition of matter to be used for imparting to wood the appearance of marble; it does not blister under the action of heat like the ordinary paint, and it is able to withstand the application of water; it is therefore peculiarly adapted to mantel shelves and washstands.

TUCK MARKER.—Nathaniel Jones. Chicago, Ill.—This invention relates to improvements in tuck making, and consists in an improved construction and arrangement of a tuck marker for attachment to the presser foot to be raised by the feed plate and pressed down by the presser foot. The invention also consists in a lateral prolongation of the presser foot, both for the connection of the tuck marker and for smoothing the folds of the tuck.

MANUFACTURE OF FELT.—Samuel Kingan, New York city, administrator of James Anderson, deceased.—This invention relates to felt fabrics, for roofing and analogus purposes, and consists in a process of preparing sheets of felt, whereby its fibers will be caused to cohere firmly, while moisture will be entirely excluded.

WASHING MACHINE.—Peter B. Shoemaker, Plattsburg, Mo.—This invention has for its object to furnish an improved washing machine, simple in construction, effective in operation, and easily operated, and which shall be so constructed as to wash the clothes by alternate pressure and saturation, without rubbing, and, consequently, without injuring even the most delicate fabrics.

PENCIL SHARPENER.—Moses W. Dillingham, Amsterdam, N. Y.—This invention relates to a new and useful improvement in instruments for sharpening lead pencils, whereby they are made more useful than they have hitherto been, and consists in combining with a pencil sharpener, an eraser for lead marks, and, also, a spring for holding the sharpener on a pencil.

SUCKER-ROD CONNECTION.—George M. Backus, Oil City, Pa.—This invention relates to a new and useful improvement in mode of fastening the wooden sucker-rod to the iron ferrule of the joint of an oil well, and consists in fixing steel springs (one or more), in the rod, and forming grooves or notches (one or more) in the ferrule, with which grooves or notches the steel springs are made to engage.

THREAD CUTTER FOR SEWING MACHINES.—John Crowe, Guelph, Ontario, Canada.—This invention relates to improvements in sewing machines, and consists in the combination with the plate, wheel, or other part of a sewing machine, of a thread cutter, conveniently arranged to cut the thread when running the work, in a more ready manner than to take up a scissors, as is now required.

WATER REGULAUOR FOR STEAM BOILERS.—G. N. Jones, Chicago, Ill.—This invention relates to a new and useful improvement in apparatus for regulating the supply and indicating the quantity of water in a steam boiler, and consists in placing a float on the surface of the water, the rise and fall of which shall, by means of rods connecting the float with a lever, control the water supply, indicate the hight of water in the boiler visibly to the eye, and sound the alarm in case of either extreme low or high water.

SHAWL STRAPS.—G. B. Broad, Waterville, Me.—This invention relates to improvements in the straps used for securing shawls and other like articles in small bundles, and carrying them by the hand, and consists in a combination with the straps, to which the handle and the binding straps are connected, of a wire frame for stiffening and strengthening it, the said frame being stitched between the upper and lower layers of the said strap, which is made of two parts or layers. The invention also consists in an improved way of attaching the binding straps to the other by metallic loops.

STOP CHAIR.—S. H. Smith, Altoona, Pa.—This invention relates to improvements in stop chairs for employment in connection with railroad rails to prevent end movement of the same under the action of the driving wheels of the locomotives, and the invention consists in chairs formed of short, narrow plates of iron or steel, twisted spirally between the ends, and shaped so that while one end lies flat upon the tie, so as to be spiked thereon, by the side of the rail, the other end will fit against the side of the rail at some distance from the tie, at an acute angle with the rail, whereby, being bolted to it, the tendency of the rail to move, acting on the holding spike in a line parallel with the rail, or nearly so, will be more easily overcome by one bolt than by two bolts in the stop chairs now used.

SWINGING STANCHIONS.—W. C. Gifford, Jamestown, N. Y.—This invention relates to a new and useful improvement in the construction and arrangement of stanchions for securing cattle in stables or barns.

CITY SUBSCRIBERS. — The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING July 19, 1870.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$10
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ..... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors. No. 37 *Park Row, New York*

105,404.—EAVES-TROUGH HANGER.—J. P. Abbott, Cleveland, Ohio.

105,405.—HOE.—Luna J. Aderhold, Wedowee, Ala.

105,406.—RING FOR HARNESS.—Samuel Aldred, Avoca, Wis.

105,407.—CAR COUPLING.—R. N. Allen, Pittsford, Vt.

105,408.—TOBACCO PIPE.—John H. Anthony, Cambridge, Md.

105,409.—SHUTTER FASTENING.—S. D. Arnold (assignor to P. & F. Corbin), New Britain, Conn.

105,410.—SUCKER-ROD CONNECTION.—G. M. Backus, Oil City, Pa.

105,411.—IRON RUNNING GEAR.—Albert Ball, Canton, Ohio.

105,412.—MODE OF ATTACHING SLEIGH BELLS.—William E. Barton, East Hampton, Conn.

105,413.—COKE OVEN.—L. F. Beckwith and Arthur Beckwith, New York city.

105,414.—TOBACCO-BOX SHOW CASE.—Adolph Bernstein, St. Louis, Mo.

105,415.—TRACE FASTENING.—C. W. Blakeslee (assignor to himself and Joseph Peck), Watertown, Conn.

105,416.—SHAWL STRAP.—Gustavus B. Broad, Waterville, Me.

105,417.—CUTTERS FOR TONGUING AND GROOVING.—Caleb Brobst, Winamac, Ind.

105,418.—HAY LOADER.—Addison Buck, Hebron, Ind.

105,419.—LEATHER-SCOURING MACHINE.—David P. Burdon, New York city.

105,420.—WEATHER STRIP.—W. H. Burghardt, Curtisville, Mass.

105,421.—MITER BOX.—H. N. Burr, Mansfield, Ohio.

105,422.—LOW-WATER INDICATOR.—R. R. Carpenter, Tippecanoe, Ohio.

105,423.—METHOD OF FORMING STUMP JOINTS FOR CARRIAGE BOWS.—A. P. Casey, Plantsville, Conn.

105,424.—PAPER-FOLDING MACHINE.—Cyrus Chambers, Jr., Philadelphia, Pa.

105,425.—MEDICAL COMPOUND FOR TREATING RHEUMATISM, ETC.—H. A. Chase, Tully, N. Y.

105,426.—ANTI-FRICTION GEARING.—Thomas Chase, Washington, D. C.

105,427.—GRAIN METER.—Francis G. Chesman, Lemont, Ill.

105,428.—PACKING TOBACCO BOX.—Wm. Cills, Philadelphia, Pa.

105,429.—GATE FOR RAILWAY CROSSINGS.—John H. Clark, Flemmington, N. J.

105,430.—HOMINY MILL.—E. M. Coombes, Memphis, Ind.

105,431.—MANUFACTURE OF WHITE LEAD.—James Cuddy, Pittsburgh, Pa.

105,432.—TENONING MACHINE.—John J. Curnan, Lyons, Iowa.

105,433.—NEEDLE FOR SEWING MACHINE.—C. R. S. Curtis, Quincy, Ill.

105,434.—ROOFING COMPOSITION.—H. L. Davis (assignor to himself and G. W. Ingalls), Worcester, Mass.

105,435.—DROP-LIGHT GASALIERS.—Charles Deavs (assignor to "the Archer and Pancoast Manufacturing Company"), New York city.

105,436.—STEERING APPARATUS.—David De Haven, New Orleans, La.

105,437.—HULL OF VESSELS.—David De Haven, New Orleans, La.

105,438.—ARRANGEMENT OF UPPER WORKS IN RIVER STEAMERS.—David De Haven, New Orleans, La.

105,439.—WASHING MACHINE.—Samuel Deveau, Syracuse, N. Y.

105,440.—PENCIL SHARPENER.—M. W. Dillingham, Amsterdam. N. Y.

105,441.—HINGE FOR BLINDS.—Adolf Ecard, Washington, D. C.

105,442.—COLLAR.—H. G. Emery and Margaret Cate Fuller, Boston, Mass.

105,443.—HORSE COLLAR.—Joseph Englaender (assignor to to himself and Eugene Lungstras), Sedalia, Mo.

105,444.—WASHING MACHINE.—Martin P. Flanders, Jay, N. Y.

105,445.—SWINGING STANCHION.—W. C. Gifford, Jamestown, N. Y.

105,446.—PLOW.—J. S. Godfrey, Leslie, Mich., assignor to himself and S. M. Loveridge. Pittsburgh, Pa.

105,447.—ELECTRO-MAGNETIC ALARM.—T. S. Hall, Stamford, assignor to Hall's Electric Railway Switch and Drawbrige Signal Company, New Haven, Conn.

105,448.—GRINDING MILL.—Daniel Halladay, Batavia, Ill.

105,449.—ELEVATOR.—D. D. Hanson, Weare, N. H.

105,450.—HYDRAULIC MOTOR.—James Harris, Boston, Mass.

105,451.—GRAIN AND SEED SEPARATOR.—Reason Hawkins, Sugar Creek, Ind.

105,452.—SHOEMAKERS' EDGE PLANE.—A. P. Hazard, North Bridgewater, Mass.

105,453.—WASHING MACHINE.—Benj. Hockabout, Antioch Cal.

105,454.—KNITTING MACHINE.—Joseph Hollen, Fostoria, Pa.

105,455.—PRESS DYEING.—John Holt, Lowell, Mass.

105,456.—PIPE COUPLING.—Richard Hoskin, Dutch Flat, Cal.

105,457.—CONDENSER FOR MARINE ENGINES.—John Houpt, Springtown, Pa.

105,458.—SOAP-CUTTING MACHINE.—Willis Humiston and H. N. Humiston, Troy, N. Y.

105,459.—ALARM TICKET NIPPERS FOR COUPON TICKETS.—Isaac Hyde, Oakland, Cal.

105,460.—CULTIVATOR.—Moses Johnson, Three Rivers, Mich.

105,461.—HIGH AND LOW-WATER ALARM.—George N. Jones, Chicago, Ill.

105,462.—PACKING.—Leopold Katzenstein, New York city.

105,463.—MACHINE FOR MAKING PRINTERS' LEADS.—Karl M. Klees, New York city.

105,464.—APPARATUS FOR THE MANUFACTURE OF ALBUMENIZED PAPER.—Jakob Klein, Hesse Darmstadt, North German Confederation, assignor to Dreyfoos, Klein & Co., New York city.

105,465.—PISTON FOR STEAM PUMPS.—Lucius J. Knowles, Worcester, Mass.

105,466.—PISTON PACKING.—Lucius J. Knowles, Worcester Mass.

105,467.—HAIR-SPRING TESTING APPARATUS FOR WATCHES.—John Logan, Boston, Mass.

105,468.—PARLOR ROULETTE.—Alexis Marais (assignor to himself and John O'Brien), St. Louis, Mo.

105,469.—SAW FOR MAKING STUFFING FOR UPHOLSTERING.—George W. Marble (assignor to himself and Charles Way), Charlestown, N. H.

105,470.—CAR COUPLING.—Charles Markley, New York City.

105,471.—CHURN.—James Mayhew, West Tisbury, Mass.

105,472.—FOLDING CHAIR.—George McAleer, Worcester, Mass.

105,473.—CORN PLANTER.—Joseph A. McClure, Mount Carroll, Ill.

105,474.—COMBINED KEY RING AND DOOR FASTENER.—Bryant H. Melendy, Manchester, N. H.

105,475.—CHURN.—J. P. Meranda, Springfield, Ohio.

105,476.—WHEEL FEED.—Joseph B. Merritt, Abington, Mass.

105,477.—HAY ELEVATOR AND CONVEYOR.—Charles A. Miller, Marengo Township, Mich.

105,478.—RAILWAY CAR SPRING.—Joseph Mitchell, Sheffield, assignor to William Edward Newton, London England. Patented in England, May 18, 1868.

105,479.—MAKING BUTTER.—Adolphe Mot, Washington, D. C.

105,480.—ORE SEPARATOR.—David Nevin, Georgetown, Colorado Territory.

105,481.—STRAW CUTTER.—Harrison Ogborn, Richmond, Ind.

105,482.—SHOE FASTENER.—Julius E. Otto, Elmore, Ohio.

105,483.—CLOTHES LINE CLAMP.—T. W. Owens, Granville, Ohio.

105,484.—PRESERVING VARIOUS ARTICLES OF FOOD.—Henry L. Palmer, Stillwater, N. Y.

105,485.—PRESERVING VEGETABLE EXTRACTS.—H. L. Palmer, Stillwater, N. Y.

105,486.—PATTERNS FOR MEASURING THE BODY FOR GARMENTS.—Moses Palmer, Jr., Boston, Mass., and E. Willoughby Anderson, Washington, D. C.

105,487.—MACHINE FOR MILLING THE KNUCKLES OF BUTT HINGES.—Emery Parker (assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.

105,488.—MACHINE FOR CENTERING BUTTS.—Emery Parker (assignor to Russell & Erwin Manufacturing Company), New Britain, Conn.

105,489.—DOOR BOLT.—Russell B. Prindle, Norwich, N. Y.

105,490.—MACHINE FOR MAKING HORSE SHOE BLANKS.—Abram Reese and Jacob Reese, Pittsburgh, Pa.

105,491.—BUFFER HEADS FOR CAR COUPLINGS.—William Rickards, Jr., Franklin, Pa.

105,492.—MARINE COMPASS.—Edward S. Ritchie, Brookline, Mass.

105,493.—ELECTRO-MAGNETIC GATE AND SIGNAL APPARATUS FOR RAILROADS.—William Robinson, Brooklyn, N. Y.

105,494.—ELECTRO-MAGNETIC GATE-OPERATING APPARATUS.—William Robinson, Brooklyn, N. Y. Antedated July 8, 870.

105,495.—OYSTER TONGS.—Joseph W. Sands, Annapolis, Md.

105,496.—HANGING MILL STONES.—Charles Schneider, Galion, Ohio.

105,497.—BRIDGE.—Jacob Seebold, Kantz, Pa.

105,498.—MACHINE FOR SPLITTING WHALEBONE.—James A. Sevey, Boston, Mass.

105,499.—MANUFACTURE OF LUBRICATING COMPOUNDS.—E. B. S. Shoemaker, Towsontown, Md.

105,500.—WASHING MACHINE.—P. B. Shoemaker, Plattsburg, Mo.

105,501.—BOOT AND SHOE STIFFENER.—Nathan J. Simonds, Woburn, Mass.

105,502.—CONCRETE PAVEMENT.—Robert Skinner and Bonnet Bonnet, San Francisco, Cal.

105,503.—GAGE COCK.—Levi F. Smith, Philadelphia, Pa.

105,504.—RAILWAY RAIL CHAIR.—Samuel Hulbert Smith, Altoona, Pa.

105,505.—FOLDING CARRIAGE FOR CHILDREN.—T. G. Stagg, East New York, N. Y,

105,506.—MACHINE FOR REMOVING GREASE FROM LEATHER James Starratt, Salem, Mass, assignor by mesne assignments to Handle Starratt and Benjamin McKeen. Antedated March 23, 1870.

105,507.—VISE.—Anson P. Stephens, Brooklyn, N. Y.

105,508.—APPARATUS FOR OPERATING WINDOW CURTAINS.—John Stephens and Jairus Collins, Fairview, Ohio.

105,509.—TRACE BUCKLE.—Charles H. Stevens, Fayetteville, N. Y.

105,510.—CABLE STOPPER.—James Stitt, San Francisco, Cal.

105,511.—PREPARATION OF CEMENT FOR THE MANUFACTURE OF CEMENT PIPE.—J. W. Stockwell, Portland, Me.

105,512.—SECRETARY SAFE.—T. J. Sullivan, Albany, N. Y.

105,513.—DEVICE FOR INSERTING THE PINTLE OR PINS IN BUTT HINGES.—L. P. Summers (assignor to P. & F. Corbin), New Britain, Conn.

105,514.—CONDIMENT OR RELISH.—W. F. Swasey, San Francisco, Cal.

105,515.—CONSTRUCTION OF CHAIRS.—D. E. Teal, New Lisbon, N. Y.

105,516.—CONSTRUCTION OF CHAIRS.—D. E. Teal, New Lisbon, N. Y.

105,517.—CONSTRUCTION OF CHAIRS.—D. E. Teal, New Lisbon, N. Y.

105,518.—GAGE PIN FOR TYMPAN SHEETS.—R. W. Thing, (assignor to himself and D. T. Pray), Boston, Mass.

105,519.—DEVICE FOR CURLING HAIR.—S. L. Tibbals, Dutch Flat, Cal.

105,520.—CENTRIFUGAL SUGAR DRAINING AND MOLDING MACHINE.—Patrick Tully, San Francisco, Cal.

105,521.—ICE CREAM REFRIGERATOR.—Carl Vignal, New York City.

105,522.—PLATFORM SCALES.—Victor Vincent, New York City.

105,523.—SAD IRON HOLDER.—E. H. G. Von Doehren and F. P. L. Reimers, Davenport, Iowa.

105,524.—CAR SPRING.—Richard Rose, New York City.

105,525.—REGULATOR FOR STEAM HEATING APPARATUS.—Alfred Walker, Portland, Me.

105,526.—MODE OF PROTECTING FRUIT TREES FROM CURCULIO, ETC.—R. J. Walker, Goshen, Ohio.

105,527.—QUARTZ MILL.—Thomas Walker, Philadelphia, Pa.

105,528.—GANG PLOW.—E. W. Walton, San Leandro, Cal.
105,529.—WEED CUTTER.—E. W. Walton, San Leandro, Cal.
105,530.—CORN POPPER AND COFFEE ROASTER.—L. A. Warner, Freeport, Ill.
105,531.—PLOW.—George Wharton, Jerseyville, Ill.
105,532.—WATER WHEEL.—H. J. White, Chatham, Iowa.
105,533.—OSCILLATING CHURN.—N. E. Wilson, Wilsonburg, West Va.
105,534.—LIFTING JACK.—G. W. Windsor (assignor to himself and J. F. Beilstein), Allegheny City, Pa.
105,535.—BASE-BURNING STOVE.—G. A. Wing, Albany, N. Y. Antedated July 12, 1870.
105,536.—WATER WHEEL.—Charles D. Wright, Leesville, Conn.
105,537.—KNITTING MACHINE.—Wm. H. Abel, Bennington, Vt.
105,538.—KNITTING MACHINE.—W. H. Abel, Lowell, Mass., assignor to himself, Robert H. Brown, and J. E. Crane.
105,539.—KNITTING MACHINE.—W. H. Abel, Lowell, Mass., assignor to himself, R. H. Brown, and J. E. Crane.
105,540.—SHINGLE MACHINE.—James E. Austin, Oswego, N. Y.
105,541.—OVEN.—Hosea Ball, New York city.
105,542.—HORSE HAY RAKE.—Newcomb M. Barnes, Tiffin, Ohio.
105,543.—MACHINE FOR SHARPENING SAWS.—J. A. Borthwick, Philadelphia, Pa.
105,544.—WINKER FOR HARNESS-BRIDLES.—William Boyd, Mansfield, Mass.
105,545.—COFFEE MILL.—T. W. Brown, Boston, Mass, assignor to Charles Parker, Meridan, Conn.
105,546.—CARRIAGE WHEEL.—Seneca B. Buck, Elyria, Ohio.
105,547.—FRUIT AND ALCOHOL STILL.—James A. Campbell, Rockingham county, Va., assignor to himself, John W. Ribble, and P. Phares.
105,548.—SEWING MACHINE AND ITS SUPPORTING TABLE.—Milton Chase, Haverhill, assignor to himself and Horace Chase, Boston, Mass.
105,549.—VALVE FOR WATER BOILERS.—E. H. Clarkson, Alexandria, Va. assignor to himself and J. H. Robinson.
105,550.—HARVESTER CUTTER.—James M. Connel, Newark, Ohio.
105,551.—SUBSOIL PLOW.—T. L. Cotten (assignor to Martha J. Cotten), Madison county, Miss.
105,552.—SYSTEM OF FIRE ALARM AND POLICE TELEGRAPH.—S. D. Cushman, New Lisbon, assignor to the Automatic Fire Alarm Co., Leetona, Ohio.
105,553.—KETTLE FOR MELTING, MIXING AND CASTING METALS.—W. S. Deeds (assignor to himself, J. H. Baer, and Geo. Koch,) Baltimore, Md.
105,554.—SHIPS' TOPMAST.—Eben Denton, Braintree, Mass.
105,555.—BLACKSMITH'S TONGS.—A. J. Dexter, North Foster, R. I.
105,556.—WARDROBE BEDSTEAD.—James F. Dodge, Nashua, N. H.
105,557.—APPARATUS FOR GENERATING AND BURNING GASES IN METALLURGIC FURNACES.—J. W. Ells (assignor to himself and S. M. Kier), Pittsburgh, Pa. Antedated July 6, 1870.
105,558.—GAS AND AIR-HEATING APPARATUS FOR METALLURGIC FURNACES.—J. W. Ells (assignor to himself and S. M. Kier), Pittsburgh, Pa. Antedated July 6, 1870.
105,559.—SPOOL-STAND AND SHOW CASE.—Eben B. Fenton and Henry S. Penfield, Chicago, Ill.
105,560.—PRESERVING AND BEAUTIFYING CRYSTALLIZED SALTS UPON GLASS, MICA, ETC.—Oscar S. Follett, New York city. Antedated July 8, 1870.
105,561.—GAS APPARATUS FOR RAILROADS, ETC.—William Foster, Jr., New York city, and G. P. Ganster, Reading, Pa.
105,562.—ELECTRO-MAGNETIC ATTACHMENT FOR SHIPS' COMPASS.—Alfred Foucaut, Orleans, France.
105,563.—BLOTTING PAD.—John F. French, Boston, Mass.
105,564.—HAND TRUCK.—Leonard Gilcon (assignor to himself and E. Stone Goodwin), Boston, Mass.
105,565.—BARREL.—Pardon H. Griswold, Grand Rapids, Mich.
105,566.—COMBINED HORSESHOE AND BOOT.—H. G. Haedrich and E. M. Haedrich, Philadelphia, Pa.
105,567.—ROAD SCRAPER.—Robert Hamilton, Franklin, Ind.
105,568.—BOLT-THREADING MACHINE.—Mahlon Hamlin, Catawissa, assignor to himself and Benjamin G. Welch, Danville, Pa.
105,569.—BOLT THREADING MACHINE.—Mahlon Hamlin, Catawissa, assignor to himself and B. G. Welch, Danville, Pa.
105,570.—SHOVEL TEETH FOR CULTIVATORS.—Thomas Harding, La Fayette, Ind.
105,571.—ORGAN STOPS.—Albert K. Hebard, Boston, Mass.
105,572.—FRUIT CAN.—Gustav E. Heinig, Louisville, Ky.
105,573.—SHADE-CORD FASTENER.—E. T. Higham (assignor to himself and Daniel Higham), Philadelphia, Pa. Antedated July 9, 1870.
105,574.—WHIP-SOCKET RING.—John J. Hillman, Boston, Mass.
105,575.—COMBINED CORN PLOW AND GRAIN DRILL.—Caswell Hollar, Abingdon, Ind.
105,576.—PROTECTING AND BEAUTIFYING CRYSTALLIZED METALLIC SURFACES.—Henry M. Johnston, New York city. Antedated July 5, 1870.
105,577.—BINDING AND HEMMING ATTACHMENT FOR SEWING MACHINES.—A. C. Kasson, Milwaukee, Wis.
105,578.—CORN PLANTER.—Isaac A. Keeler, Middleville, Mich.
105,579.—ANIMAL POKE.—William Kelly, Saranac, Mich.
105,580.—HORSE COLLAR.—Lester B. Kenney, Charlotte, Mich.
105,581.—AMMONIACAL GAS ENGINE.—Emille Lamm, New Orleans, La.
105,582.—HOOK.—R. V. Laney, Cumberland, Md.
105,583.—CAN OPENER.—William W. Lyman, West Meriden, Conn.
105,584.—COFFEE OR TEAPOT.—E. B. Manning (assignor to Manning, Bowman & Co.,) Middletown, Conn.
105,585.—PROCESS AND APPARATUS FOR THE MANUFACTURE OF PAPER.—G. E. Marshall, Laurel, Ind.
105,586.—MACHINE FOR PACKING SALT.—John McGrew, West Columbia, W. Va.
105,587.—BASE-BURNING STOVE.—J. H. Meissner, Pittsburgh, Pa.
105,588.—VISE.—George Mitchell, Trenton, N. J.
105,589.—VAPOR BURNER.—Thomas Moore, Bloomington, Ill.
105,590.—TREATING OIL WELLS TO REMOVE OBSTRUCTIONS TO THE FLOW OF OIL.—B. G. Noble, Brooklyn, N. Y.
105,591.—CHECK VALVE.—L. E. O'Brien, Latrobe, Pa.
105,592.—GRINDING MILL.—G. O'Connor and H. O'Conner, Mishawaka, Ind.
105,593.—RAILWAY RAIL CLEANER.—Carlos Ortiz and Hilario Valladares, Matanzas, Cuba.
105,594.—MANUFACTURE OF PAPER.—Henry Pemberton, Allegheny City, Pa.
105,595.—DIES FOR TRIMMING AND STRAIGHTENING AXLE CLIPS.—E. H. Plant, Plantsville, Conn.
105,596.—PAINT FOR MARBLEIZING WOOD.—F. G. Pokorny, New York city.
105,597.—HARVESTER.—Amos Rank, Salem, Ohio.
105,598.—LOCOMOTIVE WHEEL.—John R. Richardson, Max Meadows, Va.
105,599.—CONCRETE PAVEMENT.—J. J. Schillinger, New York city.
105,600.—GANG PLOW.—D. A. Sears, Rockford, Ill.
105,601.—PRUNING HOOK.—D. B. Seeley, Sterling, Ill.
105,602.—WATER WHEEL.—W. L. Selleck, Beetown, assignor to D. W. Perkins, Milwaukee, Wis.
105,603.—MORTISING MACHINE.—Henry C. Smith, Lawrence, Kansas, assignor to American Mortising Machine Company, Boston, Mass.
105,604.—WRENCH.—O. J. Smith, Wauwatosa, Wis.
105,605.—POWER PRESS.—C. M. Stratton and O. G. Stratton, Greenfield, Mass.
105,606.—BUNG CUTTER.—Nicholas J. Templeton, Cincinnati, Ohio.
105,607.—EARTH-CHAMBER PAIL.—Henry Terry, Waterbury, Conn.
105,608.—HARVESTER RAKE.—James Toay, Mineral Point, Wis.
105,609.—APPARATUS FOR COOLING AND REFRIGERATING.—P. H. Vander Weyde, New York city.
105,610.—MILLSTONE CURB.—Alexander Van Vleck and Thos. Phillips, Jordan, N. Y.
105,611.—COMBINED HORSE HAY RAKE AND TEDDER.—Henry C. Varnum, Hartford, Vt., assignor to himself and J. E. Larkin.
105,612.—HARVESTER.—H. C. Velie, Poughkeepsie, N. Y.
105,613.—BUNG.—Albin Warth, Stapleton, N. Y.
105,614.—CLAMP NUT FOR SCREWS.—Robert White, Rockville Center, N. Y., assignor to himself and Joseph J. Walton, Newark, N. J.
105,615.—WEATHER STRIP FOR DOORS.—Franklin Whitmore and Edward Conklin, Charnahon, Ill.
105,616.—WASHING MACHINE.—G. L. Witsil (assignor to himself and T. L. Bates), Philadelphia, Pa.
105,617.—FURNACE FOR STEAM ENGINES.—G. M. Wyne and Wm. Mac Grove, Dennison, Ohio.
105,618.—FLOUR-BOLT ATTACHMENT.—Obert Turner (assignor to Turner & Lutes), Rochester, N. Y.

REISSUES.

4,074.—MANUFACTURE OF WHITE LEAD.—Daniel C. Colby, Washington, D. C., and Thomas Woods and Benjamin F. Pine, Philadelphia, Pa., assignees of H. S. Hannen.—Patent No. 80,168, dated July 21, 1868.
4,075.—Division 1.—PRIMING CARTRIDGE.—Arthur Moffatt, Washington, D. C.—Patent No. 53,168, dated March 13, 1866.
4,076.—Division 2.—PRIMING CARTRIDGE.—Arthur Moffatt, Washington, D. C.—Patent No. 53,168, dated March 13, 1866.
4,077.—MODE OF ATTACHING CORNICE TO WINDOWS.—A. Peple, East Billerica, Mass.—Patent No. 101,158, dated March 22, 1870.

DESIGNS.

4,225.—JELLY CUP.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.
4,226.—STOVE DOOR AND PANEL.—M. C. Burleigh, Great Falls, N. H.
4,227.—HANDLE OF SPOONS AND OTHER ARTICLES.—Augustus Conradt, Philadelphia, Pa.
4,228.—NET FABRIC.—R. J. Jefford (assignor to A. G. Jennings), New York city.
4,229.—NET FABRIC.—Abraham G. Jennings, New York city.
4,230.—KNITTED FABRIC.—Martin Landenberger, Philadelphia, Pa.
4,231 and 4,232.—KNITTED GOODS.—Martin Landenberger, Philadelphia, Pa. Two Patents.
4,233 to 4,235.—SHAWL.—Martin Landenberger, Philadelphia, Pa. Three Patents.
4,236.—STOVE.—I. T. Montross, Peekskill, N. Y.
4,237.—CLOCK CASE.—Nicholas Muller, New York city.
4,238.—MATCH SAFE.—A. P. Seymour, Hecla Works, N. Y.
4,239.—STOVE.—G. T. Spicer, C. H. Peekham, and W. A. Spicer, Providence, R. I.
4,240 to 4,246.—STOVE PLATE.—N. S. Vedder, Troy, and Tobias S. Heister, Lansingburg, N. Y., assignors to N. S. Vedder. Seven Patents.
4,247.—TEA AND COFFEEPOT.—H. C. Wilcox (assignor to the Meriden Britannia Co.), West Meriden, Conn.
4,248.—PICTURE FRAME.—John H. Bellamy, Charlestown, Mass.
4,249.—HAND-GLASS FRAME.—John H. Bellamy, Charlestown, Mass.
4,250.—BRACKET.—John H. Bellamy, Charlestown, Mass.
4,251.—STOCKING FABRIC.—Conyers Button, Philadelphia, Pa.
4,252.—CARPET PATTERN.—Hugh Christie, Morrisania, N. Y., assignor to Israel Foster, Philadelphia, Pa.
4,253.—CARPET PATTERN.—Jonathan Crabtree (assignor to John Gay), Philadelphia, Pa.
4,254.—MUFF.—J. H. Kappelhoff and Samuel Rauh, New York city.
4,255.—SAW.—Edward Rhodes (assignor to Henry Disston & Son), Philadelphia, Pa.
4,256.—BRACELET.—Frederick Wessel, New Britain, Conn.

EXTENSIONS.

METALLIC HOOK FOR LABELS.—S. B. Fay, New York city.—No. 15,226, dated July 1, 1856.
METHOD OF MAKING BOXES.—Arasmus French, New Haven, and Charles Frost, Waterbury, Conn.—No. 15,228, dated July 1, 1856.
BREECH-LOADING FIRE-ARM.—Wm. Mont Storm, New York city.—No. 15,307, dated July 8, 1856; reissued January 1, 1867, No. 2,445.
BREECH-LOADING FIRE-ARM.—William Mont Storm, New York city.—No. 15,307, dated July 8, 1856; reissued January 1, 1867, No. 2,446.
FOLDING GUIDE FOR SEWING MACHINES.—Sady D. Boyes, Philadelphia, Pa., administratrix of the estate of Burritt C. Boyes.—No. 15,402, dated July 22, 1856.
PROCESS AND APPARATUS FOR MAKING ICE.—Alexander C. Twining, Hudson, Ohio. No. 10,221, dated November 8, 1853; patented in England July 3, 1850; extended June 21, 1864; again extended by Act of Congress; approved July 7, 1870.

GREAT VALUE OF PATENTS.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are hundreds of others who have realized large sums—from fifty to one hundred thousand dollars—and a multitude who have made smaller sums, ranging from twenty-five thousand to fifty thousand dollars, from their patents. The first thing requisite for an inventor to know is, if his invention is patentable. The best way to obtain this information, is either to prepare a sketch and description of the invention, or construct a model, and send to a reliable and experienced patent solicitor, and ask advice.

In this connection inventors are informed that

MUNN & CO.,

Publishers of the

Scientific American,

37 Park Row, New York,

Have been engaged in the business of Soliciting Patents for nearly twenty-five years, and have the most extensive facilities for transacting such business, of any concern in the world. M. & Co. have examined and reported more than

50,000 INVENTIONS,

And prepared the papers for more than

25,000 APPLICATIONS

For Patents during the last quarter of a century.

For the past ten years, the cases filed in the Patent Office by them, are about ONE THIRD of the entire number of applications filed. Their corps of specification writers and counselors are made up from the ranks of the Patent Office, and are men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office

MUNN & CO.

Offer their services in preparing

Specifications and Drawings for Patents, Caveats, Reissues, Designs, Trade Marks, Extensions, Interferences, and Assignments.

They also prosecute

REJECTED APPLICATIONS,

Which have been improperly prepared by the inventor or incompetent attorneys. Good inventions are often rejected for no other reason than that the cases were not properly presented to the Patent Office.

Inventors should bear in mind that Patents are often worth more in foreign countries than in the United States, and the reduced prices for which they are now obtained in England, France, and in other countries, render it within the means of most persons to patent their inventions abroad.

For instructions concerning

FOREIGN PATENTS,

REISSUES,

INTERFERENCES,

HINTS ON SELLING PATENTS,

RULES AND PROCEEDINGS AT THE UNITED STATES PATENT OFFICE,

THE PATENT LAWS, FEES, ETC., SEE

"HINTS TO INVENTORS,"

Which is sent free by mail on application. Advice free. Everything confidential. Address all communications to

MUNN & CO.,

PUBLISHERS

SCIENTIFIC AMERICAN,

37 Park Row, New York,

Office in Washington, corner of F and Seventh streets

Advertisements.

MACHINISTS' TOOLS FOR SALE.—A large variety of New and Second-hand Tools at VERY LOW PRICES. Railroad ave., Newark, N. J., and 119 Liberty st., N. Y. GOULD MACHINE CO.

WOOD-WORKERS.—WANTED—A practical man as foreman, experienced in care of working machinery, management of men to manufacture Chairs, Furniture, and Articles from Wood. Superior facilities. Interest given in business. Address T. R. S., Postoffice box 6,814, New York.

MACHINISTS'

STEEL TOOLS, WIRE, FILES, AND CAST Steel Patent Taps and Dies, Twist Drill and Drill Chuck, Fluted and Expanding Reamers. See Illustrated Catalogue, sent free by A. J. WILKINSON & CO., 2 Washington st., Boston.

EVERY MERCHANT AND MANUFACTURER Can be his own

STENCIL CUTTER,

And save three quarters of the present cost of his Stencils, by the use of

Metcalf's Stencil Dies.

Send for circular.

L. S. Metcalf,

Manufacturer of Stencil Tools and Stock.
101 Union st., Boston, Mass.

THE 23D ANNUAL EXHIBITION OF AMERICAN MANUFACTURES and the MECHANIC ARTS, under the Superintendence of the MARYLAND INSTITUTE, will be opened in its spacious Hall, in Baltimore, Sept. 26, 1870, and continue four weeks. The Hall will be ready for the reception of goods Sept. 19. No medals or premiums will be awarded, but the Committee on Inventions have discretionary power to report on articles of merit and utility. For particulars, address JOSEPH GIBSON, Actuary.
JAMES YOUNG, Ch. Com.

The Undersigned

HAVE established themselves as Agents for the sale of GENERAL MACHINERY, ENGINEERS' TOOLS, FOUNDERY FITTINGS, AGRICULTURAL IMPLEMENTS, RAILWAY PLANT, etc., etc. They invite the attention of Manufacturers and Inventors in the U. S., who desire to introduce their goods into Canada, and solicit Price Lists, Drawings, Descriptions, Samples, etc., to enable them to take orders. Address BUCHANAN & CO., 32 Lemoine st., Montreal. P. O. Box 643.

SUTTON'S DYNAMOMETERS FOR SALE Steam and Caloric Engines, Water Wheels, and Running Machinery tested on reasonable terms. Address JOHN W. SUTTON, 528 Water st., New York.

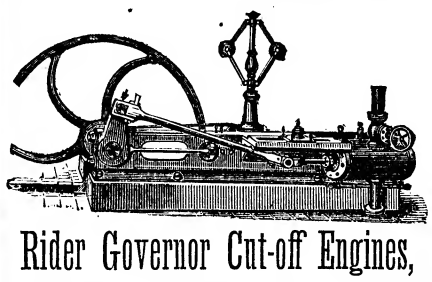
IMPORTANT

To Butter Makers!

THE ATMOSPHERIC CHURN

Is made on an entirely new principle, dispensing altogether with a dasher. It can do the work in much less time, saves a great deal of labor, brings butter more quickly, makes more of it, and is more easily cleansed, than any dasher Churn in the market. ALL THIS HAS BEEN PROVED by competition with other Churns, and any Farmer or Dairyman can be convinced by an examination. The cost is small.

AGENTS WANTED EVERYWHERE.
Address F. WETMORE & CO., 70 Washington st., Boston.



Rider Governor Cut-off Engines,

Horizontal, Vertical, and Inclined,

EMBRACING, without complication, all the perfections attained in the most complex Engines, the smallest sizes having all the excellence of the larger ones, a feature not possible in any other construction of high class expansion Engines.

THE GREATEST attainable economy and perfect regulation, by the most simple and durable mechanism. A large number now in operation. Pamphlets and Price List on application.

DELAMATER IRON WORKS,
Foot West 13th st., New York.

INVENTORS

Given assistance. Patent Rights negotiated. Inclose stamp for Circular. GERNER & TYLER, Mechanical Engineers, 258 Broadway, N. Y. P. O. Box 4544.

STEERE'S PAT. SELF-LUBRICATING Spindle Bolsters. 600,000 now in use. Parties, before ordering new Spinning Machinery, or making repairs on the old, will please send for circulars giving full particulars. ERASTUS N. STEERE, No. 10 Market Square, Providence, R. I.

Inter-State Fair

AT PITTSBURGH, PA.,

Sept. 12, 13, 14, 15, and 16, 1870.

For the General Exhibition of Live Stock, Agricultural Productions, Agricultural Implements, Machinery, New Inventions, Domestic Manufactures, and Merchandise, of every description. The Fair has been instituted under the especial promise of the united support of many of the County Agricultural Societies of Western Pennsylvania, Western New York, Eastern and Southern Ohio, and West Virginia. The scope of its influences promises, therefore, to be greater than the ordinary State Fairs. For catalogues or information address Superintendent or Secretary. Space for special exhibition can be secured. Hon. A. B. LONGAKER, Sec., Pittsburgh, Pa.
F. D. SOWER, Esq., Sup't, Norristown, Pa.

SOLUBLE or Water Glass, Silicate of Soda, & Potash, in its various forms & of superior quality, Manufactured by L. & J. W. FEUCHTWANGER, Chemists, 55 Cedar st., New York.

PATENTS.—American and Foreign Patents Sold on Commission.

Coal and Iron Mines, and Marble Quarries negotiated. Address C. H. PHELPS & CO., 98 Broadway, head of Wall street, N. Y.

REFERENCES.—Messrs. Williams, Black & Co., Cotton Merchants, 128 Pearl street; S. J. Arnold, Esq., of L. M. Bates & Co., Wholesale Dry Goods, 451 Broadway; Col. C. B. White, U. S. Gov. Weigher, 260 South street, N. Y.; D. D. S. Brown, Proprietor *Rochester Democrat*, Rochester, N. Y.

The following affidavit is respectfully submitted:

Benj. Coit, being sworn, says that C. H. Phelps & Co., have made bona fide sales of Patent Rights, Coal, and Manufacturing Properties to amount of $144,000 since June 10, 1870; that $60,000 thereof was paid in cash, balance in real estate. Sworn to before me this 12th day of July, 1870. E. H. BROWN, Notary Public, N. Y.
(Signed) BENJ. COIT, with C. H. PHELPS & CO., N. Y.

Chas. H. Phelps, being duly sworn, deposes and says, that the above affidavit of Benj. Coit is true in every statement. Sworn to before me this 23d, July, 1870.
C. T. MORSON, Notary Public,
[Signed) CHARLES H. PHELPS.

MECHANICAL ENGRAVINGS,

Such as embellish the **SCIENTIFIC AMERICAN,** are generally superior to those of any similar publication, either in this country or in Europe. They are prepared by our own artists, who have had long experience in this branch of art, and who work exclusively for us. The cost of a first-class engraving, done by our own artists, and printed in one issue of the **Scientific American,** will amount to less than one-half the sum that would have to be expended on a poor illustration, printed in the same number of circulars, and on a sheet of paper in size equal to one page of our journal. A printed handbill has no permanent value. Thousands of volumes of the **Scientific American** are bound and preserved for future reference—besides, we estimate that every issue of our paper is read by no fewer than one hundred thousand persons.

To Advertisers.

All good business men, before spending their money upon advertising, are in the habit of inquiring about the character and extent of circulation enjoyed by the journal that solicits their patronage. In this respect the publishers of the **Scientific American** challenge the closest scrutiny—the fact will show that their terms are much lower than those of any other journal of the same class in proportion to the extent of circulation.

Parties who desire to have their machines illustrated an address the undersigned, who are also prepared to send artists to make sketches of manufacturing establishments, with a view to their publication in the **Scientific American.**

MUNN & CO.,
37 Park Row, New York.

HARTFORD
Steam Boiler
INSPECTION & INSURANCE CO.

CAPITAL.....$500,000

ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to

Boilers, Buildings, and Machinery,

—ARISING FROM—

STEAM BOILER EXPLOSIONS

The business of the Company includes all kinds of

STEAM BOILERS,

STATIONARY, MARINE, AND LOCOMOTIVE.

Full information concerning the plan of the Company's operations can be obtained at the

HOME OFFICE, in Hartford, Conn.

Or at any Agency.

J. M. ALLEN, President.
C. M. POND, Vice President.
T. H. BABCOCK, Secretary.

BOARD OF DIRECTORS:

J. M. Allen.....President
Lucius J. Hendee.....President Ætna Fire Ins. Co.
F. W. Cheney.....Ass't Treas. Cheney Bro's Silk Mfg. Co.
John A. Butler.....Pres. Conn. River Banking Co.
Charles M. Beach.....of Beach & Co.
Daniel Phillips.....of Adams Express Co
G. M. Bartholomew.....Pres't American Nat'l Bank.
R. W. H. Jarvis.....Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed.....Sup't Hartford & N. Haven Railroad.
C. M. Pond.....Treas. Hartford & N. Haven Railroad.
T. O. Enders.....Sec. Ætna Life Ins. Co.
Leverett Brainard.....of Case, Lockwood & Co.
GEN. WM. B. FRANKLIN, Vice Pres't Colt's Pat. Fire Arms Man'f'g Co.
Geo. Crompton.....Crompton Loom Works, Worcester.
D. L. Harris.....Pres't Conn. River R. R., Springfield.
Earl P. Mason.....Pres't Prov. & Wor. R. R., Providence.
Hon. E. D. Morgan.....U. S. Senator, New York.

New York Office,

106 Broadway.

THOS. S. CUNNINGHAM, Agent.
R. K. McMURRAY, Inspector.

GREAT IMPROVEMENT IN CRUSHING and Grinding. To Miners, Ironmasters, Manufacturing Chemists, Superphosphate Makers, Bone Grinders, Dyewood Workers, etc, etc.—E. P. BAUGH'S Patent Sectional Crushing and Grinding Mills, for reducing to powder rocks, ores, slag, bones, logwoods, and all kinds of mineral guano, and other tough and hard substances. For illustrated circular address BAUGH & SONS, 20 S. Delaware ave., Philadelphia.

VINEGAR.—How Made from Cider, Wine Molasses, or Sorghum in 10 hours, without using drugs. For circulars, address F. I. SAGE, Vinegar Maker, Cromwell Conn.

$3.—THE AMERICAN BUILDER—One of the most valuable monthly publications of the day. Send $3 for the BUILDER, and get in addition the splendid premium of Ritchie's Irving, a fine steel engraving, size 24x32. CHAS. D. LAKEY, Publisher, 151 and 153 Monroe st., Chicago.

TO PATENTEES.
The St. Cloud Hotel,

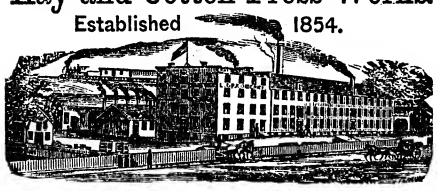
Corner 9th and F sts., Washington, D. C.,
Opposite Patent Office and Masonic Temple, and
One Block from
GENERAL POSTOFFICE DEPARTMENT.

The F street cars, communicating with the Capitol, Executive Mansion, Treasury, War, and Navy Departments, and the B. and O. R. R. Depot, pass the door.

MRS. E. A. POLLARD, Proprietress.

Hay and Cotton Press Works.

Established 1854.



DEDERICK'S HAY AND COTTON PRESSES.
P. K. DEDERICK & CO.,
PATENTEES AND SOLE MANUFACTURERS.

Dederick's Patent Progressive Lever Presses are baling at least two-thirds of the hay, straw, &c., baled in the country, and are familiarly known everywhere as the best Presses. 34 different sizes of Horse, Hand and Power Presses, for baling hay, straw, cotton, hemp, hops, cloth, hides, moss, husks, broom corn, &c. Send for Illustrated Catalogue, giving Sizes, Prices, and much other information useful to the farmer, planter, packer and shipper. Do not wait until Machines are wanted, then order in haste—but post yourself in season. We charge nothing for information. State your transportation facilities, market, &c ADDRESS,

P. K. DEDERICK & CO., Albany, N. Y.

SCREW, TAPPING, CUTTER GRINDING Machines, 12-in. speed lathes, 13, 19, 21, 24, and 27-in. engine lathes; 16, 20, 24, 30-in. planers, of various lengths; 8-in. crank planer, foot lathe, etc., etc., ready for delivery; milling, profiling, cam-cutting, die sinking machines, 15-in. engine lathes, single-spindle and gang drills; etc., etc., finishing, by the PRATT & WHITNEY CO., Hartford, Conn.

RIFLES, SHOT GUNS, REVOLVERS, etc., at reduced prices, warranted and sent by express, C.O.D., to be examined before paid for. Liberal terms to the Trade, Agents, or Clubs. Write for a price catalogue. Address GREAT WESTERN GUN WORKS, 179 Smith field st., Pittsburgh, Pa.
N. B.—Army Guns, Revolvers, etc., bought or traded for.

DESIGNS AND PLANS
OF THE
New City Hall.
OF
San Francisco, Cal.

OFFICE BOARD OF CITY HALL Commissioners, Southeast corner of Sacramento and Montgomery sts., San Francisco, June 22, 1870.

The Board of City Hall Commissioners hereby give notice that they will be prepared to receive at their office, on or before the 1ST DAY OF NOVEMBER NEXT, designs and plans for the new City Hall of San Francisco.

The Commissioners, in order to obtain the very best design and plan, invite the fullest competition among architects, and to this end have resolved to offer the following premiums:

1st—For the design and plan selected and adopted..$2,500
2d—For the second best design and plan..... 2,000
3d—For the third best design and plan..... 1,500
4th—For the fourth best design and plan..... 1,000
5th—For the fifth best design and plan..... 500

The premiums payable in City Hall warrants, equivalent to Gold Coin.

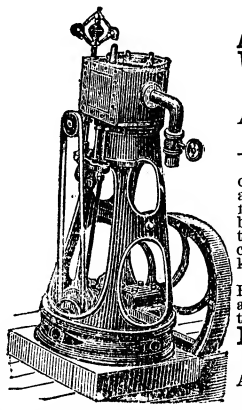
As a guide to architects, in the preparation of the designs and plans, the Commissioners have prepared a pamphlet containing full instructions and suggestions, as well as the terms and conditions upon which the premiums will be awarded.

Pamphlets, containing instructions to Architects, can be had at Wells, Fargo & Co.'s, 84 Broadway, New York.

Any design or plan in which the requirements of the Board, as set forth in the printed instructions, have not been reasonably complied with, will be rejected from the competition.

P. H. CANAVAN, Chairman,
JOS. G. EASTLAND,
CHAS. E. McLANE,
City Hall Commissioners, San Francisco, Cal.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass. Warerooms 42 Courtlandt st., New York.
WITHERBY RUGG. & RICHARDSON.



RIDER'S
AUTOMATIC CUT-OFF
Vertical Engines,
MANUFACTURED BY THE
Albany st. Iron Works,
New York.

These Engines are simple, compact, and durable, and and in point of economy of fuel and space, are excelled by none, and are cheaper than any other first-class cut-off Engines in the market.

Descriptive Pamphlets & Price lists mailed free on application to the proprietors.

Handren & Ripley,
CORNER
Albany & Washington sts., New York.

Niagara Steam Pump.
CHAS. B. HARDICK,
No. 9 Adams st., Brooklyn, N. Y.

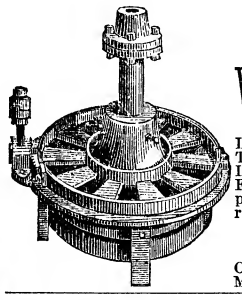
THE BEST PUNCHING PRESSES ARE made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES, Middletown, Conn.

$15 For the BEST SAW GUMMER out. Address THE TANITE CO., Stroudsburg, Pa.

MONEY Easily made with our Stencil and Key-Check Outfit. ☞ Circulars Free. STAFFORD M'F'G CO., 66 Fulton st., N.Y.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery, Models for the Patent Office, built to order by HOLSKE MACHINE CO., Nos. 528, 530, and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

---



THE BODINE
Jonval Turbine
WATER WHEEL

Warranted to exceed any Iron wheel by 5 per cent. This wheel was tested at Lowell, in 1869, by Mr. H. F. Mills, C.E., and his report of the test is now ready. Apply to G. L. LAFLIN, Treasurer, Westfield, Mass., Or Bodine M'f'g Co., Mount Morris, N. Y

HINKLEY KNITTING MACHINE

FOR Family Use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me., or 176 Broadway, N.Y.

PORTABLE Steam Engine & Boiler, complete:

4-Horse Power			$ 550
6	"	"	670
8	"	"	780
12	"	"	1,000
15	"	"	1,100
20	"	"	1,500
25	"	"	1,600

For Sale by

STATIONARY Steam Engine, without Boiler:

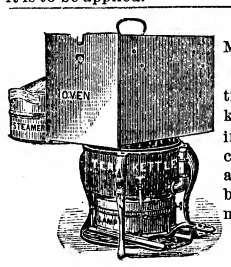
4-Horse Power			$220
6	"	"	250
8	"	"	325
15	"	"	425
25	"	"	675

☞ Send for Illustrated circular.

H. B. BIGELOW & CO., New Haven, Conn.

IMPORTANT

TO MACHINISTS.—The Best Metal for all Machine Uses is the MARTIN STEEL, made by THE NEW JERSEY STEEL AND IRON CO., Trenton, N. J. This steel is made by an entirely different process from any other, and is tougher than wrought iron. It can be turned without annealing, being entirely free from hard spots. Every one who uses it pronounces it just what they have long wanted, for a multitude of uses, such as Crank Pins, Lathe Spindles and Screws, Cotton Machinery Rollers, Saw and Fan Spindles, etc., etc. Also, particularly adapted for Firebox Plates. Prices Low. Send for further information, or a sample, stating use to which it is to be applied.



CHICAGO, June 18, 1870.

MR. R. B. MITCHELL,—

I am using your Combination Cooking Stove for all kinds of cooking, and find it indispensable, and most cheerfully recommend it to all who wish a summer stove, both for comfort and economy.

MRS. C. L. EASTMAN, 926 Fulton st.

Small Engine Lathes,

And every description of small Lathes, with Foot Motion. Also, Brass Finishing Lathes and Tools, made by EXETER MACHINE WORKS, Exeter, N. H.

U.S. PIANO CO. N.Y. $290. FOR 1ST CLASS 7 OCT SENT ON TRIAL. CIRCULARS MAILED FREE.

L. W. Pond's New Tools.

NEW AND IMPROVED PATTERNS—Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters Punches and Shears for iron. Office

98 98 98

Liberty st., N. Y.
Works, at Worcester, Mass. S.N. HARTWELL, Gen. Agt.

Wheel Machinery

Of every description made by EXETER MACHINE WORKS, Exeter, N. H.

Andrews' Patents.

Noiseless, Friction Grooved, Portable, and Warehouse Hoisters.
Friction or Geared Mining & Quarry Hoisters.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, half to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.
WM. D. ANDREWS, ANDREWS & BRO., 414 Water street, New York.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057, Boston, Mass.
N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

LATHE CHUCKS—HORTON'S PATENT—from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON Windsor Locks Conn

---

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa.

CAMDEN
Tool and Tube Works,

Camden, N. J. Manufacturers of Wrought Iron Tube, and all the most improved TOOLS for Screwing, Cutting, and Fitting Pipe Tube and Oil Well Casing. Screwing Machines of different sizes to screw and cut off from the largest to the smallest sized Pipe or Casing. Peace's Patent Adjustable Pipe Cutter. No. 2 cuts off from ⅛ to 2 Pipe, $9·00. Peace's Pat. Screwing Stocks and Dies, No. 1 Screws ¼, ⅜, ½, ¾, $10. No. 2 screws 1, 1¼, 1½, 2 pipe, $20. No. 3 both screws and cuts off, 2½, 3, 3½, 4, $65.

PATENTEES

Who have failed in their efforts to dispose of their rights will do well to consult us, either personally or by mail, free of charge. Many valuable inventions are lying dormant, for want of proper management, that might realize a fortune for their owners, if placed in our hands, and brought to the attention of capitalists. Only those will be accepted which we feel satisfied can be sold, as our object is solely the realization of a commission. A candid opinion can therefore be relied upon. No charge for services unless successful. References on application. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall st., New York.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels Churches, Factories, & Public Buildings, Heated by Steam Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st.) N.Y. All parties are hereby cautioned against infringing the Pat. right of the above Pump. G. M. WOODWARD, Pres't

---

J. P. GROSVENOR'S
PATENT ADJUSTABLE
Circular Saw Benches,
AND PATENT IMPROVED
VARIETY MOLDING MACHINES,

And Wood-working Machinery in general, manufactory at Lowell, Mass., salesroom 91 Liberty st., New York city.

1832. SCHENCK'S PATENT 1870.
Woodworth Planers.

And Re-sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK & SON, Matteawan, N. Y., and 118 Liberty st., New York.

PATENT BANDSAW MACHINES of the most improved kinds, of various sizes, by FIRST & PRYIBIL, 452-456 Tenth ave., New York. Price $250, $275, $350. At present (March 28), there are in operation, in this city alone, 76 of our Machines.
☞ Send for Circular.

DIES FOR CUTTING BRASS MARKING Plates, Good Shaped Letters, Sharp Cutting Edges, on best cast steel, Hardened and Tempered Heads and Faces, and warranted the best. Samples sent. ROBERT ROGERS, 26 Spruce st, New York.

MILLER'S FALLS CO. Manufacture Barber's Bit Brace, No. 87 Beekman st., New York.

OTIS' SAFETY HOISTING *Machinery.*
OTIS BROTHERS & CO.
NO. 309 BROADWAY, NEW YORK.

SHINGLE AND HEADING MACHINE—Law's Patent with Trevor & Co.'s Improvements The Simplest and Best in use. Also, Shingle, Heading and Stave Jointers, Equalizers, Heading Turners, Planers etc. Address TREVOR & CO., Lockport, N. Y.

CINCINNATI BRASS WORKS.—Engineers' and Steam Fitters' Brass Work. Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r,

---

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS. 602 Cherry st., Philadelphia, Pa.

WOODBURY'S PATENT
Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, {91 Liberty street, N. Y.;
Send for Circulars. {67 Sudbury street, Boston

WATER-FLAME LIME KILN—BEST IN THE WORLD. Rights for sale. C. D. PAGE, Rochester, N. Y.

THE MERRIMAN PATENT BOLT CUTTERS—Unrivaled by any. Cuts V, half-V, square, or round threads, on any size bolt, at one cut, with revolving dies that are instantly adjusted to the slightest variation, and opened to release the bolt when cut. The dies are changeable without turning a nut or screw Send for illustrated circular. BROWN & BARNES, Fair Haven (near New Haven), Conn.

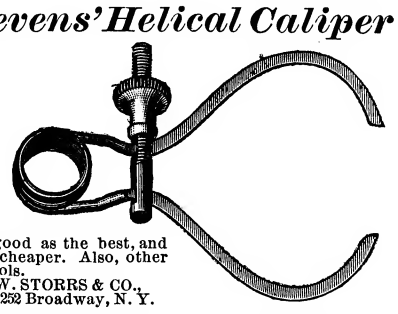
$250 A Month with Stencil & Key Check Dies. Don't fail to secure Circular and Samples free. Address S. M. SPENCER, Brattleboro, Vt.

Grinding and Bolting

MILLS—For grain & all substances, ground and bolted. Bolt within the mill casing, and the bolting instantaneous with the grinding. Capacity of flour mill 3 feet by 4—a barrel and a half per hour. Corn Mills, with vertical and horizontal spindles. Over 2,000 sold. EDWARD HARRISON, New Haven, Conn.

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **750** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address J. C. HOADLEY & CO Lawrence Mass.

Stevens' Helical Caliper



As good as the best, and much cheaper. Also, other fine tools.
J. W. STORRS & CO., 252 Broadway, N. Y.

PLATINUM. H. M. RAYNOR, 25 Bond st., N. Y

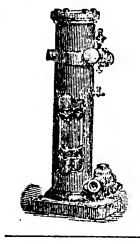
MASON'S PAT'T FRICTION CLUTCHES are Manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 123 Ave. D, New York · TAPLIN RICE & CO. Akron, Ohio 16 tfeow

---

STEAM HAMMERS, STEAM ENGINES
GAS MACHINERY, SUGAR MACHINERY
BY
MERRICK & SONS,
PHILADELPHIA, PA.

"GEAR'S VARIETY MOLDING MACHINE,—**A. S. & J. Gear & Co.,** Manufacturers; also, dealers in all kinds of Wood and Iron Working Machinery, Belting, etc. Address, **56** SUDBURY ST., BOSTON, MASS.

FARIES' PIPE THUMB. Excellent for screwing up pipes, etc., with common wrenches; nothing done to the wrench; one suitable for various sizes. One sent by mail, postpaid, for 75c.; two for $1·25; 1 doz., by Express, C.O.D., $4·50; fair discount to the trade. Address R. FARIES, Decatur, Ill.



Independent Steam
BOILER SUPPLY
OR
Feed Pump.
RELIABLE FOR HOT OR
COLD WATER

Circulars sent free. COPE & CO., No. 118 East 2d st., Cincinnati, Ohio

---

MORSE'S PATENT

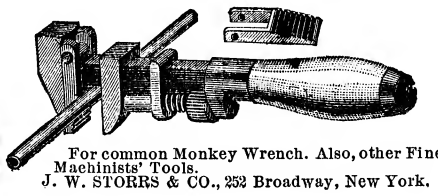
Boiler Tube Cleaner.

THE BEST AND MOST DURABLE, and Sold at a Low Price. The only Scraper which never clogs, but cleans the foulest tubes thoroughly.
A. H. & M. MORSE, Franklin, Mass.

ESTB. **ENOCH MORGAN'S SONS'** 1809.

SAPOLIO,
For General Household Purposes
IS BETTER AND CHEAPER THAN SOAP.

Page's Auxiliary Jaw.



For common Monkey Wrench. Also, other Fine Machinists' Tools.
J. W. STORRS & CO., 252 Broadway, New York.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line. Engravings may head advertisements at the same rate per line, by measurement as the letter-press.*

MARX & RAWOLLE, Proprietors of the
N. Y. Glycerin Works,
And Manufacturers of Varnishes, Sealing Wax, Bleached Shellac, etc., 179 William st., New York.

SEAMLESS
Brass & Copper Tubes,
For Locomotive, Marine, and Stationary Engines.
For sale by MERCHANT & CO.,
Importers and Dealers in METALS,
517 and 519 Minor st., Philadelphia.

The WATCHES made by the
NEW YORK WATCH COMPANY
Are the BEST & CHEAPEST.
Ask to See Them. Factory, Springfield, Mass.

YALE LOCKS.
BEST & CHEAPEST.
HARDWARE TRADE.
YALE LOCK MFG. CO. No. 1 BARCLAY ST. N.Y.

DEPARTMENT OF DOCKS, 346 AND 348 BROADWAY, New York, July 16, 1870.

THE COMMISSIONERS OF THE DEPARTMENT OF DOCKS, having received, in accordance with the provisions of Sec. 33, of Chap. 333, laws of 1870, in public meetings, various plans for the establishment of permanent wharf accommodations for the commerce of New York, they now, in accordance with the further provisions of said section, advertise for plans for the best method of improving the water front and harbor of the city of New York, by a new system of wharves, piers, docks, basins, and slips, which shall accommodate the present commerce of the city and harbor, and shall provide for the future expansion thereof, and for the facilitation of the transportation of freight along the water-front, so as to render the whole water-front of the city available to the commerce of the port.

Said plans will be received until September 15, 1870.

Plans are solicited that shall contain provision for the special accommodation of steamers and vessels engaged in foreign trade, in domestic trade, in the coal trade, in the trade in lumber and building material, in the hay and grain trade, in furnishing market supplies; also, for the accommodation of steamboats plying to places on the Hudson River and Long Island Sound, for the canal boats arriving in this city, and for the railroads and other commercial interests.

Plans should be accompanied by all necessary documents, estimates, and particulars.

JOHN T. AGNEW,
WILSON G. HUNT,
HUGH SMITH,
WILLIAM WOOD,
RICHARD M. HENRY,
Commissioners of the Department of Docks.

CINCINNATI
Industrial Exhibition.
MANUFACTURERS OF
Products and Arts.

PROPOSALS FOR THE USE OF
ENGINES AND SHAFTING.

PROPOSALS WILL BE RECEIVED UNTIL August 10, 1870, by the CINCINNATI INDUSTRIAL EXPOSITION COMMITTEE for two Horizontal Steam Engines, of not less than twelve-inch bore, and without Pumps or Heater. Also, two Lines of Shafting, one hundred and forty-six feet long, with coupling and post hangers. Bids will be received for 1 Engine and 1 line of shafting. The Machinery must be in operation on or before Sept. 20th. Full specifications will be furnished on application to A. L. FRAZER, Secretary. Manufacturers are presented with a rare opportunity to exhibit their Machinery. The Machine Department will be one hundred and fifty by one hundred and fifty, and the Miscellaneous Department one hundred and ten by two hundred and fifty feet. Rules and regulations furnished on application to

C. I. WILSTACH, President.

HEAVY CASTINGS For Forge and Mill Work. The M. & T. SAULT CO., Steam Engine Builders & Founders, New Haven, Conn.

Facts for Builders.

ALL who contemplate building or making improvements, can save time, money, and build more intelligently by consulting the Practical Elevations, Plans, and Details contained in Bicknell's Village Builder, one large quarto volume of 55 Plates, just published, price $10, postpaid. Descriptive circulars of new Architectural Books mailed free. A. J. BICKNELL & CO., Publishers, Troy, N. Y., and Springfield, Ill.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

Working Models
And Experimental Machinery, Metal or Wood, made order by J. F. WERNER 62 Center st., N. Y

SEAL ENGRAVERS' DIE LETTERS—Seals and Presses. Steel Dies, Brass Labels, Cutting Punches, Brass Stamps, Stencil Plates, Name Punches, Brands for burning, etc., etc., made by
ROBERT ROGERS, 26 Spruce st., New York.

P. Blaisdell & Co.,
MANUFACTURERS OF MACHINISTS' Tools, Improved Engine Lathes, Planers, Boring Mills, Gear Cutters, Hand Lathes, Traverse Drills, and the "Blaisdell" Patent Upright Drills. Jackson street, Worcester, Mass.

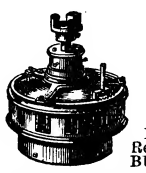
C. B. WARRING'S MILITARY BOARDING SCHOOL, for Boys, Poughkeepsie, N. Y. Send for Circular.

BURDON IRON WORKS,—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. Hubbard & Whittaker, 102 Front st., Brooklyn.

One Million Acres of Choice Iowa Lands

FOR SALE AT $3 PER ACRE, and upward, for cash, or on credit, by the **Iowa Railroad Land Co.** Railroads already built through the Lands, and on all sides of them. Great inducements to settlers. Send for our free Pamphlet. It gives prices, terms, location; tells who should come West, what they should bring, what it will cost; gives plans and elevations of 18 different styles of ready-made houses, which the Company furnish at from $250 to $4,000, ready to set up. Maps sent if desired. Address
W. W. WALKER, Vice President, Cedar Rapids, Iowa.

WATER WHEELS.
WARREN'S NEW GRADUATING TURBINE.—If you would be convinced that almost perfection in Water Wheels has been reached, send for circular of 1870. A. WARREN, Agent.
Boston, Mass.


POWER PLEDGED
Equal to any overshot, with
N. F. BURNHAM'S
New Turbine
Water Wheel.
Illustrated Pamphlet, for 1870, "with Reduced Price List," sent free by N. F. BURNHAM, "Patentee," York, Pa.

$2,000 a year & Expenses to agents to sell the celebrated WILSON SEWING MACHINES. The best machine in the world. *Stitch alike on both sides.* ONE MACHINE WITHOUT MONEY. For further particulars, address
THE WILSON SEWING MACHINE CO.,
Cleveland, Ohio, Boston, Mass., or St. Louis, Mo.

Newspaper Advertising.

A Book of 125 pages, contains a list of the best American Advertising Mediums, giving the names, circulations, and full particulars concerning the leading Daily and Weekly Political and Family Newspapers, together with all those having large circulations, published in the interest of Religion, Agriculture, Literature, &c., &c. Every advertiser, and every person who contemplates becoming such, will find this book of great value. Mailed free to any address on receipt of fifteen cents. GEO. P. ROWELL & CO., Publishers, 40 Park Row, New York.

The Pittsburgh (Pa.) *Leader*, in its issue of May 29, 1870, says: "The firm which issues this interesting and valuable book, is the largest and best Advertising Agency in the United States, and we can cheerfully recommend it to the attention of those who desire to advertise their business *scientifically* and *systematically* in such a way that is, so to secure the largest amount of publicity for the least expenditure of money."

American Saw Co., Manufacturers of

And Perforated Circular, Long, and Hand Saws. Also Solid Saws of all kinds. No 1, Ferry st., cor. Gold st., New York. Branch Office for Pacific coast, No. 606 Front st., San Francisco, Cal.

ERICSSON'S
Caloric Engine.
SAFE, ECONOMICAL, DURABLE. USES NO WATER. REQUIRES NO ENGINEER.

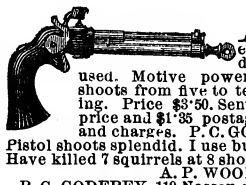
Having made arrangements for manufacturing this Engine on an extensive scale, we are now prepared to furnish to all desiring a light power, the best and most economical engine ever offered to the public.

DELAMATER IRON WORKS,
Foot of West 13th st., New York.
Branch Office:—JAS. A. ROBINSON, 130 Broadway.

AT
Greatly Reduced Prices
Drawing Instruments of every description, Transits, Levels, Compasses, Chains, Tape Measures, Drawing Papers and Materials.
JAMES W. QUEEN & CO.,
924 Chestnut st., Philadelphia Pa.
☞ A Manual and Catalogue sent on application.

EMPLOYMENT.
$250 A MONTH with Stencil Dies. Samples free. Address
S. M. SPENCER, Brattleboro, Vt.

SHAW & JUSTICE'S DEAD STROKE
POWER HAMMERS,
For heavy or light forging and die work. Superior to any others. Durable and simple. P. S. JUSTICE,
4 North 5th st., Philadelphia. 42 Cliff st., New York.

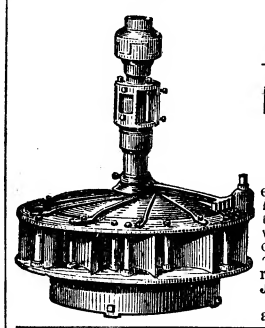

AIR TARGET PISTOL.—Hawley's Patent, June 1, 1869. No powder or percussion caps used. Motive power—Compressed Air, and shoots from five to ten shots from once charging. Price $3·50. Sent by mail on receipt of price and $1·35 postage, or by express, C.O.D., and charges. P. C. GODFREY, DEAR SIR:—My Pistol shoots splendid. I use bullets and shoot squirrels. Have killed 7 squirrels at 8 shots with it. Yours,
A. P. WOOD, North Hamden, N. Y.
P. C. GODFREY, 119 Nassau st., N. Y. Agents wanted

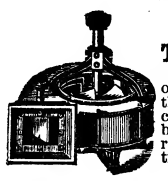
PATENT COLD ROLLED SHAFTING.

The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to JONES & LAUGHLINS,
120 Water st., Pittsburgh, Pa.
☞ Stocks of this shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. GEO. PLACE & CO., 126 Chambers st., New York.

London.....48 Cannon street.
H. KOHNSTAMM,
Manufacturer of
ULTRAMARINE,
And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 100 Chambers street, between Broadway and Church st., New York.

Prices Reduced.


LEFFEL'S
DOUBLE
TURBINE
Best Water Wheel in existence. Send for New Price List, adopted June 1, 1870. Also, for large wheel book for 1870, JUST OUT. Sent free by addressing the manufacturers,
JAMES LEFFEL & CO.,
Springfield, Ohio.
and New Haven, Conn.

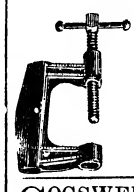

Reynolds'
Turbine Water Wheels.
The Oldest and Newest. All others only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch reliable, economical power. Beautiful pamphlet free. GEO. TALLCOT,
96 Liberty st., New York.
Gearing Shafting.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn 5 tf os

WIRE ROPE.
JOHN A. ROEBLING'S SONS,
Manufacturers, Trenton, N. J.
FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty st.

HANDEL, MOORE & CO., Consulting Engineers, 95 and 97 Liberty st., New York, and at 71 Lord st., Liverpool, England, make a specialty of negotiating the sale of American Patents or Royalties in Europe, and establishing Agencies for manufactures; also, find Capital to work out new inventions. Assistance given to Inventors to take out patents upon meritorious articles. All kinds of European machinery imported. Agents in France, Belgium, and Germany. Address P. O. Box 5669, New York city.

DRILLS
Diamond-Pointed
DRILLS, with Imp'd Machinery for all kinds of Rock Drilling, Well Boring, and Prospecting.
SEVERANCE & HOLT, Office 16 Wall st., New York.
☞ Illustrated Circular sent on application.


LECOUNT'S PATENT HOLLOW LATHE DOGS AND CLAMPS.—A set of 8 Dogs from ⅜ to 2-in., inclusive, $8. A set of 12 from ⅜ to 4-in., $17·30. Five sizes Machinists' Clamps, from 2 to 6-in., inclusive, $11. Send for Circular.
C. W. LECOUNT.
South Norwalk, Conn.

COGSWELL'S IMPROVED FRUIT PICKER. Just Patented. Rights and Pickers for sale. Apply to L. D. COGSWELL, Box B, Rockford, Ill.

BAND SAWS.
PATENT BAND SAW MACHINES, MADE by Perin & Co. for Log, Re-sawing, and Scroll. Mongin & Co.'s Saw Blades, in stock and made to order from ⅜ to 6 inches wide, 50 ft. long. Saws and Machines Warranted.
Also, Taper Files, etc.
All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R.
GEORGE GUEUTAL,
Sole Agent for the U. S., 39 West 4th st., N. Y

Improved Awning.

COMMUNICATIONS concerning purchase o Rights should be addressed to J. B. ARMSTRONG, Urbana, Ohio.

It obviates the necessity for posts or supports at the front edge, provides a neat and effective shelter for the awning when rolled up, is perfectly easy to spread out or roll up, is simple in construction, and remarkably tasteful in appearance. It can be fully or partially extended to admit or exclude light without the aid of a step ladder, and in a moment's time. We consider this form of Awning as far superior to any form of canvas awning heretofore employed, combining, as it does, durability, convenience, and comeliness. On exhibition at Whitlock's, Nos. 35 and 37 Park Place, New York. See Scientific American dated Nov. 27, 1869.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

MACHINERY, New and 2d-Hand.—Send for circular. CHAS. PLACE & CO., 60 Vesey st., New York.

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 788 South 2d st., Philadelphia Pa.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 1

☞ T. V. Carpenter, Advertising Agent. Addres hereafter, Box 773, New York city.

Harrison *Safety Boiler.*
First-class Medal, World's Fair, London, 1862.
And American Institute Fair, New York, 1869.
Over 1000 Boilers in use.
Address Harrison Boiler Works, Philadelphia, Pa., or JOHN A. COLEMAN, Agent,
110 Broadway, New York, and 139 Federal st., Boston

CAUTION.
Weston's Patent Differential PULLEY BLOCKS.
75,000 IN USE.

MEDALS: World's Fair, 1862; Paris 1867; N. Y. State Fair, 1867, etc.

WASHINGTON, D. C., June 8, 1867.—In an Interference between the claim of T. A. Weston and the patent of J. J. Doyle, the priority of Weston's well-known invention was fully established. The public are hereby cautioned not to buy or use any Differential Pulleys marked "*DOYLE*," "*BIRD*," or "*LONGLEY*," legal proceedings being now in progress for the suppression of infringement. Parties who have purchased infringements of Weston's patent, may obtain licenses, legalizing the use of the same, upon reasonable terms, on application to

T. A. WESTON,
43 Chambers street, N. Y.,
or his Attorneys, ABBETT & FULLER, 229 Broadway, N. Y.

The genuine Weston's Pulleys have improved hard metal Sheaves durable as chilled castings, without brittleness, and each pulley is tested For terms, etc., address

HARRISON BOILER WORKS,
Philadelphia, Pa.

Caution.
Doyle's Patent Differential *PULLEY BLOCKS.*

We caution all parties using "Doyle's" Pulley Blocks against making any terms with Weston on his assertion of infringement. "*We will protect our customers in the use of every Block we sell.*" The interference between the claim of J. J. Doyle and T. A. Weston was decided by the Com. of Pat. in favor of Mr. Doyle on the 18th day of Oct., 1866, and since that official decision, Mr. Doyle has never received any notice of any other application by Weston or of any other interference, and hence a patent cannot nave been granted legally to he said Weston. *The celebrated Doyle Blocks have taken premiums* over Weston's and all other makers' blocks at every Fair where they have been exhibited at the same time. We don't use the chilled or very hard metal sheaves for the reason that they soon wear out the chain, which costs $10·40 on a ½-ton block, and a new sheave only costs $1·25. Orders solicited.
SAM'L HALL'S SON & CO.,
229 West 10th street, New York
Sole Manufacturers.

THE
Tanite Emery Wheel.
Does not Glaze, Gum, Heat, or Smell. Address
THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

ROOT'S WROUGHT IRON SECTIONAL
Safety Boiler.
Composed of best Wrought Iron Tubes, tested to 500 pounds; no large sheet iron, shell or thin cast iron to explode. Absolutely safe, economical, durable, and efficient. Send for pamphlet. Also, Steam Engines, Steam Pumps, etc. ROOT STEAM ENGINE CO.,
95 and 97 Liberty st., New York.

$15 For the BEST SAW GUMMER out Address THE TANITE CO., Stroudsburg, Pa.

USEFUL POLYTECHNIC MATERIALS. Manganese, Fluorspar, Feldspar, Asbestos, Bloodstone, Hydrofluoric Acid, all Metallic Oxides, rarest metals, glass makers' and potters' substances, for sale by L. & J. W. FEUCHTWANGER, Importers of Drugs, Minerals, and Chemicals, No. 55 Cedar st., New York.

THE SCIENTIFIC AMERICAN *FOR 1870.*
A SPLENDID PREMIUM.

This Illustrated Weekly Journal of Practical Information, Art, Science, Mechanics, Invention, Chemistry, and Manufactures---Entered its Twenty-fifth Year on the 1st of January.

The SCIENTIFIC AMERICAN stands at the head of the Industrial Journals of the world in point of Circulation and Influence.

Every number has Sixteen Imperial pages, embellished with Engravings of New Inventions, Machinery Tools for the Workshop, House, and Farm, also Public Buildings, Dwelling Houses, and Engineering Works.

The Illustrated Department of the SCIENTIFIC AMERICAN is a very striking feature, and has elicited the praise of the Press; and all articles appearing in its columns are written in a popular and instructive style.

To Inventors and Mechanics the SCIENTIFIC AMERICAN has special value and interest, from the fact that it furnishes an Official List of Patents issued, with copious notes of the principal American and European Patents.

The Publishers offer as a Premium for Clubs the large and splendid Steel Engraving—"American Inventors," as follows: Any one sending ten subscribers for one year and $30, will receive a picture, or twenty subscribers and $50, will receive one picture. A club may be made up from different postoffices.

For full particulars and sample copies of the SCIENTIFIC AMERICAN, address the Publishers.

Terms of the SCIENTIFIC AMERICAN: Single copies one year, $3·00; six months, $1·50; and one dollar for four months. To Clubs of ten and upward, $2·50 each per annum.
MUNN & CO.,
37 Park Row New York.

THE SCIENTIFIC AMERICAN is printed with Ink furnished by CHAS. ENEU JOHNSON & CO., Tenth and Lombard sts., Phil'a. 59 Gold cor. Ann st., New York.